The development and testing of a generic musculoskeletal version of the Pain Attitudes and Beliefs Scale

Kirsty Duncan

A thesis submitted for the degree of Doctor of Philosophy

October 2017

Keele University

Research Institute of Primary Care and Health Sciences

Abstract

Background: Attitudes and beliefs that healthcare practitioners (HCPs) hold about musculoskeletal (MSK) pain influence their clinical behaviour. The Pain Attitudes and Beliefs Scale (PABS), originally developed for low back pain (LBP), is the most widely used and tested measure of HCPs' attitudes and beliefs, however further development and testing is indicated. Poor performance of its biopsychosocial orientation scale is attributed to inadequate conceptualisation of the orientation.

Aims: To develop a new biopsychosocial orientation scale for the PABS and adapt the original LBP specific version as a measure of HCPs' attitudes and beliefs about common MSK pain.

Methods: The research was conducted in six stages. Firstly, a scoping review identified constructs used to quantify HCPs' attitudes towards common MSK pain. Stage two used a concept mapping methodology to develop a new conceptual framework for biopsychosocial clinical orientation to common MSK pain. This framework was used to generate candidate items for redevelopment of the biopsychosocial scale (stage three) and then included in a national survey of physiotherapists, GPs and chiropractors (stage four) to collect data for initial development and testing (stage five and six).

Results: The resultant conceptual framework consisted of six primary domains of biopsychosocial clinical orientation (bio-clinical, therapeutic relationship, individual patient aspects, emotions, social and work) which informed the development of candidate scale items. Psychometric analyses of survey data identified a new 10-item, single factor PABS biopsychosocial scale and confirmed the original PABS biomedical scale; both scales demonstrated good reliability.

Conclusion: The new version of the PABS (the PABS-MSK) is the most comprehensively developed measure of HCPs' attitudes and beliefs concerning MSK pain to date. The biomedical scale is robust and while both scales require further validation, the research provides a solid conceptual grounding for further amendments of the measure. The conceptual framework provides a contemporary comprehensive understanding of the biopsychosocial clinical approach to MSK pain.

Acknowledgements

I would like to thank my supervisors Dr. Annette Bishop and Professor Nadine Foster for the opportunity to do this research and for their advice and feedback throughout the programme of work. Thanks are also extended to Dr. Paul Campbell and Dr. Elaine Thomas who provided additional support during the initial and factor analyses of the survey data.

I would like to acknowledge the ACORN PhD funding provided by Keele University and the Research Institute of Primary Care and Health Sciences, and the Arthritis Research UK Centre funding which supported the national survey of GPs, physiotherapists and chiropractors (The DABS study).

I would also like to express my appreciation to the clinicians and researchers who participated in the two primary studies within this thesis, iPCHS colleagues who supported the international concept mapping workshop and the DABS study administrative team. Particular thanks must go to Mr. Ashley Ford for his persistence in bringing the concept mapping software to life!

However my most heartfelt gratitude goes to SMc and DS - 'the fellowship'. I could not have done this without you; which is often said, but can rarely have been so true.

For Betty

Quantum in me fuit

Additional funding awards obtained in support of this programme of work

November 2012: Keele Postgraduate Association Bursary (£252) in support of attendance on the clinimetrics course at VUMC, Amsterdam

March 2013: Research Institute of Primary Care and Health Sciences Postgraduate research fund (£10,000) in support of the DABS study (Developing a musculoskeletal Attitudes and Beliefs Scale)

Contents

List of appendices

List of tables

List of figures

List of boxes

List of abbreviations

AACP	-	Acupuncture Association of Chartered Physiotherapists
ABS.mp	-	Attitudes to Back Pain Scale for Musculoskeletal practitioners
ADF	-	Asymptotically distribution free estimation
BBQ	-	Back Beliefs Questionnaire
BBQ-HC	-	Back Beliefs Questionnaire - Health care providers
BCA	-	British Chiropractic Association
CFA	-	Confirmatory factor analysis
CLBP	-	Chronic low back pain
CSP	-	Chartered Society of Physiotherapy
CI	-	Confidence interval
CTT	-	Classical test theory
COSMIN	-	COnsensus-based Standards for the selection of health Measurement INstruments
DALY	-	Disability adjusted life years
Df	-	Degrees of freedom
EFA	-	Exploratory factor analysis
EM	-	Estimation maximisation
FA	-	Fear avoidance
FABQ	-	Fear Avoidance Beliefs Questionnaire
FIML	-	Full-information maximum likelihood
GP	-	General Practitioner
GBD	-	Global Burden of Diseases
GCC	-	General Chiropractic Council
GMC	-	General Medical council
HCP	-	Healthcare practitioner
HC-PAIRS	-	Health Care Provider's Pain and Impairment Relationship Scale
HPA	-	Hypothalamic-Pituitary-Adrenal

HSE	-	Health and Safety executive
IC	-	Internal consistency
ICC	-	Intraclass correlation coefficient
IPCHS	-	Institute of Primary Care and Health Sciences
IRT	-	Item response theory
KMO	-	Kaiser-Meyer-Olkin
K-S	-	Kolmogorov-Smirnov
LBP	-	Low back pain
LoA	-	Limits of agreement
MAR	-	Missing at random
MCAR	-	Missing completely at random
MCRS	-	Medical Condition Regard Scale
MDS	-	Multidimensional scaling
MI	-	Modification index
MIS	-	Minimal intervention strategy
ML	-	Maximum likelihood
MSK	-	Musculoskeletal
NHS	-	National Health Service
NP	-	Neck Pain
NSBP	-	Non-specific back pain
OT	-	Occupational therapist
PABS	-	Pain Attitudes and Beliefs Scale
PABS-PT	-	The Pain Attitudes and Beliefs Scale for Physiotherapists
PABS-MSK	-	The Pain Attitudes and Beliefs Scale for common MSK pain
PAF	-	Principal axis factoring
PAIRS	-	Pain and Impairment Relationship Scale
PCA	-	Principal components analysis

PCS	-	Pain Catastrophising Scale
PHODA	-	Photograph series of daily activities
PRICE	-	Protection, rest, ice, compression, Elevation
PRISMA	-	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PT	-	Physiotherapist
REC	-	Research Ethics Committee
RCGP	-	Royal College of General Practitioners
RMSEA	-	Root mean square error of approximation
RTW	-	Return to work
SDC	-	Smallest detectable change
SEM	-	Standard error of measurement
SPSS	-	Statistical Package for the Social Sciences
SRMR	-	Standardised root mean square
STI	-	Soft tissue injuries
TDM	-	Tailored design method
TSK	-	Tampa Scale of Kinesiophobia
TSK-HC	-	Tampa Scale of Kinesiophobia - healthcare providers
UK	-	United Kingdom
USA	-	United States of America
WHO	-	World Health Organisation
YLD	-	Years lived with disability

Chapter 1: Thesis overview

1.1 Chapter introduction

This chapter provides a brief synopsis of each of the subsequent chapters and includes a schematic overview of the thesis. This is followed by a list of dissemination activities resulting from the work described in the thesis and additional publications currently in preparation. Finally, the approvals obtained from the relevant Research Ethics Committees for the studies described in this thesis are reported.

1.2 Brief background to the research

Musculoskeletal (MSK) conditions are highly prevalent and burdensome both in the UK and globally (Parsons et al. 2007; Hoy et al. 2014). They cause more functional limitations than any other group of disorders within the adult population and lead to enormous healthcare expenditure and loss of work (Walsh et al. 2008; Hoy et al. 2014). The ageing population and increase in sedentary lifestyles suggests that the burden of MSK conditions on individuals, carers and society will continue to increase (Prince et al. 2015; Briggs et al. 2016). Treatment for patients with MSK conditions is at best moderately effective, due in part to the inconsistent and limited implementation of evidenced based guidelines and recommendations (Francke et al. 2008). One possible reason for the inadequate uptake of best evidence in every day clinical practice is related to the attitudes and beliefs of healthcare practitioners (HCPs) towards MSK pain and its management (Darlow et al. 2012). HCPs' attitudes towards MSK pain are associated with their clinical behaviour and are therefore likely to impact on patients' behaviour and outcome (Vlaeyen & Linton 2006; Pincus 2013). However, there is little research into HCPs' attitudes and beliefs towards MSK pain in comparison to patients' attitudes and beliefs and there are a number of inherent methodological difficulties in measuring HCPs' attitudes and beliefs. Several measures of HCPs' attitudes and beliefs have been developed, although all have important limitations.

Amongst the most robust is the Pain Attitudes and Beliefs Scale (PABS) which consists of two scales; the biomedical orientation scale and the biopsychosocial orientation scale (Ostelo et al. 2003) (see Appendix 1). Although the biomedical scale has robust measurement properties, the biopsychosocial scale is considered to have a number of weaknesses leading to calls for its further development (Watson et al. 2008; Mutsaers et al. 2012). A key limitation is that it was developed for and has been modified to measure HCPs' attitudes and beliefs towards specific MSK conditions such as low back pain (LBP) or neck pain (NP) rather than MSK conditions in general.

1.3 Aims and structure of the thesis

The aims of this thesis are to develop and test a version of the PABS for use as a measure of HCPs' attitudes and beliefs about common MSK pain and to develop a new biopsychosocial scale for this generic version. To achieve these aims this thesis presents the work undertaken in six, sequential stages of scale development. These are:

1. A scoping review to identify the attitudinal constructs previously used to quantify HCPs' attitudes towards common MSK pain
2. A concept mapping process to develop a new conceptual framework for HCPs' biopsychosocial clinical orientation to common MSK pain
3. The generation of new biopsychosocial items derived from the conceptualisation study; and adaptation of the existing LBP specific PABS items for testing in a generic version of the measure
4. A national survey of general practitioners (GPs), chiropractors and physiotherapists to collect data on the candidate biopsychosocial items and the generic versions of the existing PABS items developed

5. Development and initial testing of a new measure of HCP's attitudes and beliefs about common MSK pain (the PABS-MSK)
6. Further psychometric analysis to establish the test-retest reliability, measurement error and smallest detectable change (SDC) of the redeveloped, generic PABS-MSK

The presentation of each of these stages and structure of this thesis are illustrated in the schematic overview in figure 1.1.

1.4 Summary of thesis chapters

The remaining chapters of this thesis are as follows:

Chapter 2 - Introduction and background

This chapter provides relevant background information about common MSK pain and critically reviews the literature concerning the role of HCPs' attitudes, with a particular focus on evaluating the psychometric properties of currently available measures of HCPs' attitudes and beliefs towards MSK pain conditions.

Chapter 3 - The attitudinal constructs used to quantify HCPs' attitudes and beliefs: a systematic scoping review

This chapter describes a scoping review conducted prior to embarking on the scale development process. The aim was to identify the attitudinal constructs from the published literature which have previously been used to quantify HCPs' attitudes and

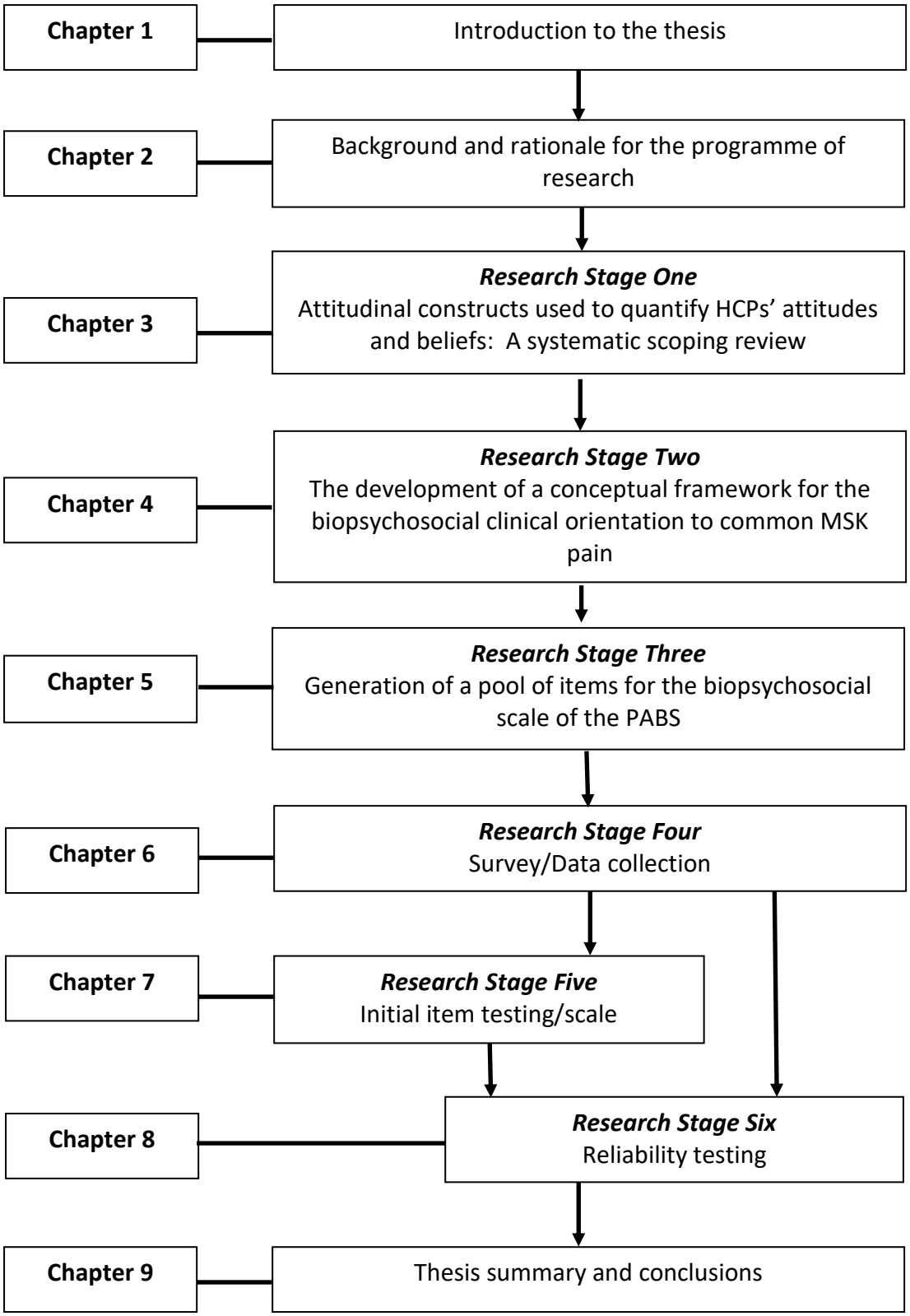


Figure 1.1: Schematic overview of the programme of work and thesis structure
HCPs=Healthcare practitioners, MSK=musculoskeletal, PABS=Pain Attitudes and Beliefs Scale

beliefs about common MSK pain and to determine whether there were any existing measures or groups of items which might serve in the development of the new PABS biopsychosocial clinical orientation scale.

Chapter 4 - The development of a conceptual framework for the biopsychosocial clinical orientation to common musculoskeletal pain

This chapter details a grounded conceptualisation study which used the novel, mixed method of concept mapping. This study was conducted as the critical first step in the scale development process, the specification of a conceptual framework for the target construct.

Chapter 5 - Generation of a pool of new biopsychosocial items and adaptation of existing items for use in a generic version of the Pain Attitudes and Beliefs Scale

This chapter describes the development of a pool of candidate items for potential inclusion in the new PABS-MSK using firstly, the conceptual framework derived from the concept mapping process in chapter 4 and secondly, existing PABS items amended for use as generic MSK items.

Chapter 6 - Development of a new generic musculoskeletal version of the Pain Attitudes and Beliefs Scale: A national survey of General Practitioners, Chiropractors and Physiotherapists

This chapter describes the nationwide postal survey of UK-based HCPs' attitudes and beliefs about common MSK pain which formed the fourth stage of this scale development process. The aim was to collect responses to the extended pool of new and existing biopsychosocial items and the generic versions of the existing biomedical items in order to

conduct subsequent stages of scale development and psychometric testing of the new PABS-MSK.

Chapter 7 - Development of a new generic musculoskeletal version of the Pain Attitudes and Beliefs Scale: Development, factor analysis and internal consistency

This chapter summarises the processes of testing and reducing the pool of new and existing PABS items and the final selection of those to be included in a new biopsychosocial clinical orientation scale, in addition to early testing of the structural validity of both scales of the new PABS-MSK using confirmatory factor analysis (CFA).

Chapter 8 – Development of a new generic musculoskeletal version of the Pain Attitudes and Beliefs Scale: Test-retest reliability

This chapter presents an investigation of the test-retest reliability, measurement error and smallest detectable change (SDC) of the new biopsychosocial scale and the generic version of the (existing) biomedical scale of the PABS-MSK.

Chapter 9 - Thesis discussion and conclusion

The final chapter of this thesis summarises the key findings from the PhD programme, discusses the contribution this research makes to the understanding and investigation of HCPs' attitudes and beliefs, and details the resultant implications and recommendations for MSK clinical practice and future research.

1.5 Publications, presentations and awards

The following summarises the dissemination activities that shared the methods and results from this PhD programme of research, along with further dissemination plans.

Scientific conference presentations and associated awards

The biopsychosocial model in musculoskeletal clinical practice (conference workshop)

Duncan, Kirsty; Bishop, Annette; Foster, Nadine E; Pincus, Tamar; Bronfort, Gert; Loisel, Patrick. International Forum for Back Pain Research in Primary Care, Odense, Denmark, October 2012. *Awarded a CSP Charitable Trust International Lecture Fund Award*

Development of a new conceptual framework for the biopsychosocial clinical approach using concept mapping methodology (conference oral presentation)

Duncan, Kirsty; Foster, Nadine E; Bishop, Annette. World Confederation of Physical Therapy Congress, Singapore, April 2015

The redevelopment of the Pain Attitudes and Beliefs Scale: a measure of healthcare practitioners' attitudes and beliefs about musculoskeletal pain (conference oral presentation)

Duncan, Kirsty; Foster, Nadine E; Campbell, Paul; Thomas, Elaine; Bishop, Annette. World Confederation of Physical Therapy Congress, Singapore, April 2015. *Awarded a CSP Charitable Trust Robert Williams International Award*

Development of a new conceptual framework for the biopsychosocial clinical approach using concept mapping methodology (conference oral presentation)

Duncan, Kirsty; Foster, Nadine E; Bishop, Annette. *International Forum for Back & Neck Pain Research in Primary Care, Buxton, UK, June 2016*

Development of a new conceptual framework for the biopsychosocial clinical approach using concept mapping methodology (conference oral presentation)

Duncan, Kirsty; Foster, Nadine E; Bishop, Annette. International Federation of Orthopaedic Manipulative Physical Therapists Conference, Glasgow, UK, July 2016

Manual Therapy, vol. 25, e51-e52; http://dx.doi.org/10.1016/j.math.2016.05.067

Conference presentations within Keele University and associated awards

Healthcare practitioners' attitudes and beliefs in common musculoskeletal pain: Why the re-development of an existing measure? (conference oral presentation)

Duncan, Kirsty; Foster, Nadine E; Bishop, Annette. *Institute of Primary Care and Health Sciences Postgraduate Symposium, May 2012*

Concept mapping (conference oral presentation)

Duncan, Kirsty. Institute of Primary Care and Health Sciences Research Methods Seminar, June 2012

Concept mapping the biopsychosocial approach to musculoskeletal pain (conference oral presentation)

Duncan, Kirsty; Foster, Nadine E; Bishop, Annette. Institute of Primary Care and Health Sciences Postgraduate Symposium, May 2013*. Awarded one of two prizes for presentation*

Improving the measurement of healthcare practitioners' biopsychosocial attitudes and beliefs about musculoskeletal pain (conference oral presentation)

Duncan, Kirsty. Institute of Primary Care and Health Sciences Internal Seminar, December 2013

Papers in preparation

Development of a new conceptual framework for the biopsychosocial clinical approach using concept mapping methodology

Duncan, Kirsty; Foster, Nadine E; Bishop, Annette. *In development*

The redevelopment of the Pain Attitudes and Beliefs Scale: A measure of healthcare practitioners' attitudes and beliefs about musculoskeletal pain

Duncan, Kirsty; Foster, Nadine E; Campbell, Paul; Afolabi, Ebenezer; Chiarotto, Alessandro; Thomas, Elaine; Bishop, Annette. *In development*

Chapter 2: Introduction and background

2.1 Chapter introduction

This chapter introduces the field of common MSK pain, its emergence as one of the leading causes of global disability and the paradigmatic shifts in thinking about common MSK pain and its management observed in recent decades. An overview of the role of attitudes and beliefs in the experience of common MSK pain and associated disability is presented, highlighting the impact that HCPs' attitudes and beliefs may have on their patients. This section further identifies the methodological challenges faced by researchers in this area to date, and the limitations of existing measures of HCPs' attitudes and beliefs about common MSK pain. This chapter ends with a review of the psychometric properties of the PABS, which is one of the most widely used and tested of the existing measures (see Appendix 1).

2.2 What is common musculoskeletal pain?

The term 'non-specific' is widely used in MSK clinical and research literature to describe pain which is not attributable to a recognisable, specific pathology such as infection, tumour, osteoporosis, fracture, structural deformity, inflammatory disorder or radicular or spinal cord syndromes (Balagué et al. 2012; Salathé & Elfering 2013). The term has been common parlance in the field of MSK pain since the principles of diagnostic triage were advocated for LBP (Waddell 1982). This is the process whereby the small proportion of LBP presentations attributable to specific, serious spinal pathology or nerve root compression or irritation are differentiated from 'ordinary', 'mechanical', 'simple' or non-specific LBP (Waddell 2004). The purpose of assigning these generic diagnostic labels has been to communicate the benign nature of the problem to the patient and direct subsequent healthcare management away from unnecessary investigations and treatments (Waddell 2004).

Non-specific MSK presentations are characterised by patterns of recurrence, persistence and fluctuation across the life course (Dunn et al. 2013; Nicholls et al. 2014) and wide differentials in individual experience and consequent disability (Kongsted et al. 2016). Although LBP has dominated the MSK literature, similar prognostic patterns, variability of symptoms and limited response to treatment have been observed for a range of common MSK pain including neck, shoulder and knee pain (Mallen et al. 2007; van der Windt et al. 2008). The term and definition would therefore be equally applicable to all non-specific MSK pain. However, to emphasise the focus of this thesis on MSK in all anatomical regions, which includes but is not limited to LBP, the term common MSK pain has been adopted. However, common MSK pain is defined in exactly the same way – that is, pain not attributable to a specific serious pathology.

2.3 The burden of common musculoskeletal pain and disability

The experience of common MSK pain is so ubiquitous it might almost be considered part of the human condition. The lifetime prevalence of LBP alone is reported to range from 51% to 84% (Henschke et al. 2015), with median estimates of one-year incidence of a first-ever episode varying from 11% to 20% (Hoy et al. 2010; Taylor et al. 2014). Estimates of the prevalence of neck, shoulder and knee pain include 30% (Hogg-Johnson et al. 2008), 19% (Pribicevic 2012) and 20.5% (Peat et al. 2001) respectively. Common MSK problems are characterised by their persistence or recurrence (Kongsted et al. 2016), and results from the General Household Survey in the UK suggest that 14.3% of the adult population report having a longstanding MSK condition (Office for National Statistics 2009; Parsons et al. 2007).

The associated burden of MSK conditions has historically been under-recognised (Buchbinder et al. 2013; March et al. 2014). However, with the use of metrics for both disability (years lived with disability, YLD) and overall disease burden (disability-adjusted life years, DALYs) which includes both fatal and non-fatal components, the Global Burden of Disease (GBD) 2010 Study has illuminated the enormous global burden of MSK conditions (Murray et al. 2012). As a group, MSK conditions were found to be responsible for 21.3% of global disability, second only to mental health and behavioural problems (Hoy et al. 2014). MSK conditions were also found to be the fourth greatest burden on health globally.

With great burden, comes great cost to the individual, healthcare organisations and wider society. Many individuals with an MSK condition experience pain, disability, social limitations and long-term work incapacity which can lead to reduced quality of life and financial hardship (Waddell 2006; Haukenes et al. 2014). In addition many of these patients have negative perceptions of their general health, experience symptoms of depression and distress, which can have a dramatic effect on relationships and interactions with others (Froud et al. 2014). Musculoskeletal conditions account annually for around 17% of GP consultations, over 3.5 million visits to emergency services and 8.8 million physiotherapy appointments (Jordan et al. 2010). In 2008-09 the UK National Health Service (NHS) spent over £4 billion on musculoskeletal conditions alone (British Society for Rheumatology 2010). These direst clinical costs are dwarfed by indirect costs to the wider economy through long-term work absence, reduced work productivity and disability pension payments (Palazzo et al 2014; Tymecka-Woszczerowicz et al 2015). The Health and Safety Executive (HSE) reported that 8.8 million working days were lost in the UK in 2015/16 due

to MSK conditions (Health and Safety Executive 2016). In 2012 the total economic cost to the UK of working days lost to a musculoskeletal disorder was estimated by the HSE as £7.4 billion (Chartered Society of Physiotherapy 2012).

2.4 The management of common musculoskeletal pain and disability

The greatest burden lies not with transient MSK conditions which prove to be self-limiting, respond to simple interventions such as the PRICE (Protection, Rest, Ice, Compression, Elevation) regime, analgesics and return to usual activities including work (Speed et al. 2006; Kannus et al. 2003); requiring minimal healthcare intervention (Pincus et al. 2013; Bergman 2007). However when pain persists beyond the expected time of healing MSK conditions can become chronic, persistent or recurrent (Bergman 2007). Commonly more than one anatomical body region is affected, resulting in cumulatively increased problems with performing daily tasks (Conaghan & Brooks 2008). In addition negative perception and reaction to MSK conditions can lead to unnecessary avoidance of physical activity and social interactions, absenteeism from work, and high health care utilisation (Pincus et al. 2013). It is persistent MSK pain of this type which confers the greatest burden on individuals, employers, healthcare systems and society in general (Breivik et al. 2013). Management of patients with a persistent pain problem becomes complex because of the availability of a wide range of imaging and diagnostic tools, the need for regular assessment of disease impact, the presence of co-morbidities, the wide range of treatment options that are available and the large number of HCPs that can become involved (Conaghan & Brooks 2008).

In the UK, the NHS is still primarily free at point of delivery and paid for through general taxation. Primary care is provided by GPs and increasingly by allied health professionals

(AHPs) such as nurses and physiotherapists, where studies have shown that approximately 30% of consultations with a GP are for a MSK complaint (Briggs 2012). Individuals with common MSK conditions are also treated by the quarter of qualified physiotherapists (Beddow 2010) and the majority of osteopaths and chiropractors in the UK who work in the private sector. Referral of individuals with MSK conditions to secondary care can therefore be through numerous routes, which has contributed to the existence of multiple pathways of care, inconsistent management and a lack of uniformity across different regions (Briggs 2012). However current UK treatment guidance suggests that patients with an MSK condition should be managed in primary care, by the appropriate health professional e.g. GP, physiotherapist, chiropractor or osteopath (NICE 2014). If a specialist opinion or further investigation is required, then the patient should be referred for assessment in a Musculoskeletal Clinical Assessment Treatment Service, which sit at the interface between primary and secondary care. These services were designed to manage the growing burden of common MSK conditions on orthopaedic services and to increase guideline concordant care (Briggs 2012, Button et al. 2016).

Most persistent MSK pain conditions frequently require a multi-modal management strategy to deal with multi-factorial problems (Conaghan & Brooks 2008; Bergman 2007). However the management of chronic pain is frequently reported as being inadequate (Breivik et al. 2006; Moore et al. 2014). Two primary medical approaches to the management of common MSK pain exist; biomedical and biopsychosocial.

2.4.1 The biomedical model of pain and disability

For much of the last century, the dominant paradigm in healthcare has been the biomedical model (Havelka et al. 2009). The basic premise of this model is that there is a direct, one-

to-one relationship between physical signs of disease and accompanying symptoms (Main et al. 2008). In the context of MSK pain this translates into three basic assumptions: that pain is the direct result of tissue damage or injury, that pathways responsible for pain travel from the source of injury or disease to the brain and that the amount of pain experienced is proportional to underlying tissue damage or injury (Keefe 2011). Treatment within this model is therefore directed at identifying and addressing disease, pathology or abnormality; with the expectation that once rectified, any associated symptoms will also disappear (Wade & Halligan 2004). As a consequence, biomedical assessment and treatment approaches to managing MSK pain are pain contingent, tissue-based, and sanctioned by HCPs (Gabe et al. 2004). Within this framework, symptoms which exist in the absence of medically identifiable pathology, or which persist after treatment, are often attributed to delegitimising states such as hysteria, hypochondriasis or functional overlay (Main et al. 2008).

The biomedical model of disease, coupled with the scientific, technological and economic advances of the twentieth century has been extremely effective in combating communicable diseases (Weiner 2008), and in managing acute medical or surgical conditions where there is a close relationship between the symptoms, signs and disease (Main et al. 2008). Such has been the dominance of both the model and profession of biomedicine in Western societies, that it has become the culturally engrained perspective about disease (Engel 1977). Consequently, the biomedical model has underpinned the policies and practices that have defined our healthcare services. Resources are allocated for the diagnosis and specific treatment of disease, with most healthcare systems operating on the presumption that treatment after diagnosis is brief and acts quickly (Wade &

Halligan 2004). However, the second half of the last century witnessed the paradox of ever increasing biomedical intervention and expenditure, yet a simultaneous, exponential increase in disability (Waddell 1987). Furthermore, an evolving understanding about the nature and physiology of pain, which were not consistent with the biomedical model, had begun to signal the failure of the approach to stem the burgeoning epidemic of non-communicable disease (Havelka et al. 2009). Finally, Engel concluded that "medicine's crisis derives….from adherence to a model of disease no longer adequate for the scientific tasks and social responsibilities of….medicine" (Engel 1977, p.129). However, despite the evolution in our understanding of pain, the biomedical model remains deeply entrenched in our cultural understanding (Morris 1998; Vaughn et al 2009).

2.4.2 Biopsychosocial model of pain and disability

The requirement for a new 'biopsychosocial model' was identified in response to the limitations of the biomedical model (Engel 1977). This model described the dynamic integration of pathophysiological, psychological and social variables of illness (Main et al. 2008). Numerous theoretical and empirical contributions have driven the evolution of biopsychosocial theory (Vancleef et al. 2012 in Hasenbring et al. 2012). Loeser's model linking nociception, pain, suffering and pain behaviour with the social context, was acknowledged as a major conceptual shift in the understanding of pain (Main et al. 2008). The initial application of the biopsychosocial model to MSK pain by Waddell in 1987 explored the physical and psychological factors which underlie the varying degree of disability experienced by individuals with seemingly similar levels of physical impairment (Waddell & Main 1984).

The biopsychosocial model of pain continues to be underpinned by advances in a wide range of fields including epidemiology, neurophysiology, psychology, and sociology. Epidemiological studies have exposed the myriad risk and prognostic factors for MSK pain (Mallen et al. 2007; Dunn et al. 2013). Understanding of pain neurophysiology has expanded rapidly. For example, there is greater understanding of the effect of trauma and psychological distress on the hypothalamic-pituitary-adrenal (HPA) stress function, (McBeth et al. 2005; Finestone et al. 2008), the dynamic interactions between psychosocial factors and physical health problems and pain (Finestone et al. 2000; Teasell 1999) and the role of fear avoidance beliefs (Vlaeyen & Linton 2012; Crombez et al. 2012). Pain is now understood to be multidimensional and the product of higher order psychological and mental processing; whereby sensory information is integrated with memories, emotional factors and cognitive processes of appraisal and attribution (Flor & Turk 2015). The role and the mechanism of immune system mediators in modulating pain processing is also increasingly recognised (McMahon et al. 2015).

As a result of these advances, the assessment and treatment advocated within a biopsychosocial approach to common MSK pain have also evolved to include psychosocial as well as physical factors (Main et al. 2008). Elicitation of information regarding patients' beliefs, emotional responses, pain coping strategies and maladaptive behaviours including careful assessment of patients' socioeconomic and work status are considered essential to reach a rational evidence-based management strategy suitable for the patient undergoing assessment (Main et al. 2008). Key elements of the approach relate to counselling patients about avoidance of unnecessary investigations and procedures and discussion regarding realistic expectations and outcomes of treatment (Sjolund 2008 in Main et al. 2008).

Psychosocial treatments may include: relaxation strategies, mindfulness meditation training, pain education, graded exposure, motivational interviewing, acceptance-based CBT interventions, goal setting, addressing of modifiable lifestyle factors and recommendations to return to usual activities including work (Jensen 2011; Sullivan & Adams 2010; Main et al. 2008). A patient with a chronic MSK condition may receive varying selections or combinations of these strategies (Sullivan & Adams 2010).

The biopsychosocial approach is now the basis of clinical practice guidelines for management of common MSK pain worldwide and has long been enshrined in the World Health Organization's International Classification of Functioning, Disability and Health model (World Health Organization 2002). Despite this broad acceptance, in principle if not in practice (Edwards et al. 2016), the model is not without its critics. Some authors suggest that too much emphasis has been placed on psychological variables and too little weighting of the biomedical (Hancock et al. 2011) and social variables (van der Windt & Dunn 2013) which has rendered the biopsychosocial model equally reductionist as the biomedical model (Quintner et al. 2008, Weiner 2008).

In spite of the general academic and scientific advocacy for the biopsychosocial approach and increasingly sophisticated approaches to implement biopsychosocial clinical practice guidelines (Michie et al. 2011), the prevalence of common MSK pain and disability has continued to increase (Murray et al. 2012); and with a few notable exceptions, clinical results have generally been disappointing (Williams et al. 2012; Artus et al. 2010). Numerous reasons may explain these limited findings. Attempts to integrate psychosocial interventions into current clinical practice may have been compromised by poor quality of interventions, poor skills of those delivering them, lack of clear outcomes and little support

from healthcare organisations, funders and commissioners (Pincus et al. 2013; Slade et al 2015, Fischer et al 2016). However a well-recognised barrier to the implementation of evidence-based guidelines is HCPs' attitudes and beliefs about common MSK pain and its management (Darlow et al. 2012); which may be attributable, in part, to the education which HCPs receive.

Health education has been criticised in the past for being proficient at delivering sophisticated scientific knowledge and technical skills about the body and its pathologies, whilst simultaneously failing to convey the importance of psychological and social aspects of illness and patient care (Engel 1979). Although the application of the biopsychosocial model to HCP education curricula has long been advocated and has found broad acceptance in many academic institutions (Engel 1979; Alonso 2004) evidence points to a gap in the application of the biopsychosocial model in HCP education and in particular a lack of contemporary pain education. The failure to explicitly utilise the biopsychosocial approach to inform educational curricula and to provide adequate levels of pain science education has been observed across medicine, dentistry, occupational therapy, nursing, pharmacy, and physiotherapy in the UK, USA and Norway (Jaini & Lee 2015; Hoeger-Bement & Sluka 2015; Briggs et al. 2011). Despite the establishment of core pain management competencies to advance pain education for pre-licensure HCP students, there is wide disparity in the amount of pain education received by different HCPs (Hoeger-Bement & Sluka 2015; Briggs et al. 2011; Leegaard et al. 2014). For example, in the UK, the average pain content of undergraduate curricula was 12 hours, with time ranging from two to 158 hours. Physiotherapy undergraduates received the highest input, averaging 37.5 hours with pharmacists (eight hours) and midwives (six hours) receiving the least pain

education (Briggs et al. 2011). Briggs et al. (2011) concluded that the amount of pain education in the curricula of UK healthcare professionals was woefully inadequate given the burden of pain in the general population in the UK.

2.5 The role of attitudes and beliefs in common musculoskeletal pain and disability

2.5.1 What are attitudes and beliefs and what is their relationship with behaviour?

2.5.1.1 Beliefs

In the simplest of terms, belief is the acceptance that something is true, irrespective of its veracity (Ajzen 2005). In this regard beliefs can be differentiated from knowledge, which is characterised as the accuracy of an individual's belief (De Vaus 2002). Beliefs are the "mental scaffolding" for appraising, explaining and integrating new observations (Halligan & Aylward 2006) and are the product of experience, learning and culture from childhood onward (Burton et al 2006 in Halligan & Aylward 2006). Beliefs are distinct from, but intimately related to attitudes, with social cognition models such as the theory of planned behaviour (Ajzen 1991), generally positioning beliefs as antecedent to attitude about a target object (Stroebe 2000).

2.5.1.2 Attitudes

Attitudes are central to the field of soocial psychology (Schwarz & Bohner 2007) and as a consequence of such prolonged attention, definitions have changed over time. However, the evaluative nature of attitude has remained the focus in much of the literature, with (Eagly & Chaiken 1993) describing attitude as "a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour" (p.1). Although historically and theoretically attitdude has been considered to be a relatively constant tendency (Reid 2006), debate continues with regard to the stability of attitudes due to the

inconsistency observed in individuals' attitudes both over time and in different contexts (Ajzen & Fishbein 2001). While much of the issue may lie in the pursuit of capturing the 'truth' of an evaluative predisposition that exists only in the mind of an individual (Schwarz 2007), one approach to examining apparent attitude instability has been to include both conscious or reflective and un-conscious, implicit elements in dual process models of attitude (Wilson et al. 2000; Evans 2008; Johnston et al. 2015).

However, it has been argued that while modelling attitudes as divisible has advanced understanding of the dissociations that can occur between different measures of attitudinal response, these should not be conflated with fluctuation in the underlying tendency (Eagly & Chaiken 2007). In making this point, Eagly and Chaiken (2007) stress the theoretical importance of distinguishing between attitudes, and their expression in the form of evaluative judgements and responses. Attitudinal responses can be: cognitive (expressions of belief or perceptual reactions to an object); affective (expressions of feeling or physiological reaction); and conative (expressions of behavioural intent or overt behaviour with respect to the attitude object) (Ajzen 2005; Reid 2006). All these responses can be overt or covert, and as they are subject to both internal and external influence, are contextually sensitive (Krosnick et al. 2005). Therefore the expression of a stable attitude may be observed to vary dependent on circumstance (Eagly & Chaiken 2007). That is not to say that attitudes are considered to be immutable, although less deeply ingrained attitudes are more liable to change than those which are more fundamental to an individual (Strobe 2000).

2.5.1.3 The relationship of attitudes and beliefs with behaviour

If the nature and stability of attitudes continues to stimulate much debate and enquiry, then so too does their relationship with behaviour. Although a detailed review of this literature is beyond the scope of this introductory chapter where it will only be discussed briefly, comprehensive reviews are provided by Ajzen and Fishbein (2005) and Vogel & Wanke (2016). Again, much of the impetus in this area has been driven by the seemingly inconsistent relationship between an individual's expression of attitude, such as their behavioural intention, and their actual behaviour. Key theoretical advances include the principle of aggregation, whereby general attitudes which may be poor predictors of single behaviours provide more accurate prediction of multiple-act, behavioural aggregates; and compatibility, as a consequence of which single behaviours are predicted well by compatible measures of attitude about the specific behaviour (Ajzen 2005). Extension of the principle of compatibility fuelled interest in behavioural intention as a more pertinent cognitive antecedent of behaviour than more general attitudes toward an object (Ajzen and Fishbein 2005).

Subsequent investigation of the gap that was often observed between stated intention and subsequent behaviour, led to the development of a number of explanatory models. These models, which include the theory of reasoned action (Fishbein & Ajzen 1975) and the theory of planned behaviour (Ajzen 1991), incorporate a number of the contextual and background factors known to influence behaviour. These include: social norms, perceived behavioural control, personality traits, age and gender (Ajzen 2005). These models have gained considerable traction in the study of clinical behaviour and provide the framework for much of the work on implementation to date (Michie et al. 2008, Michie et al. 2011).

2.5.2 Attitudes and beliefs in musculoskeletal pain

The attitudes and beliefs that individuals hold have been shown to be inextricably linked to their experience of pain and its consequences (Linton & Shaw 2011; Pincus & McCracken 2013) with many different constructs being shown to be associated with less favourable outcomes in terms of pain persistence, activity limitation and work loss (Symonds et al. 1996, Carroll et al. 2008, Wertli et al. 2014). However until recently, the relative importance of the different attitudes and beliefs investigated in the context of MSK pain was unclear; with the likelihood of overlap between the conceptual frameworks, and as a consequence redundancy in the measurement, of the different attitudinal constructs (Foster et al. 2010). However, in a factor analytic study of a range of psychological measures, Campbell et al (2013) identified four factors, 'pain-related distress', 'cognitive coping', 'causal beliefs' and 'perceptions of the future', which accounted for 65.5% of the variance in the scores of those measures. Furthermore, a meta-analysis of mediation studies found that self-efficacy, psychological distress and fear mediate the relationship between pain and disability in people with LBP and neck pain (Lee 2015). It has been hypothesised that collectively, these key constructs can be conceptualised as resulting from, or contributing to, the threat associated with pain (Darlow et al. 2015).

The pain experience of a patient with a MSK disorder is directly influenced by their appraisal of the threat level associated with that disorder. Current theories characterise pain as an output of an "activated body protection system" (involving motor, autonomic, psychological, endocrine and immune systems) in response to threat (Jones and O'Shaughnessy 2014). The perceived threat level may be influenced by that person's attitudes and beliefs about that MSK disorder. A patient's beliefs and attitudes will also

inform their behavioural responses such as the likelihood that they will rest, avoid activity or consult an HCP (Iles et al. 2009).

An individual's attitudes, beliefs and expectations concerning MSK pain will develop, along with their health beliefs in general, throughout their life-course (Burton et al in Halligan and Aylward 2006). They are the product of an individual's own learning and experience and that of others; and informed by the myriad socialisation influences to which people are exposed (Vargas-Prada & Coggon 2015). These might include: family and friends, school, workplace, the media and internet (Briggs et al. 2010). As more patients increasingly "go online" the internet has become the most popular source of medical information, particularly amongst those with greater health literacy, educational attainment and higher incomes (UK Digital Health Report 2015; BMJ 2015). However, HCPs are still considered to be an important source of information (Darlow et al. 2013) and the influence that HCPs may have in propagating or reinforcing patient beliefs has come under scrutiny in recent years (Pincus et al 2013).

It has been observed that those who seek healthcare for common MSK problems may already have a greater perceived need than those who do not consult (Darlow 2016). This may be due to greater disability, higher levels of pain, or a perception of need based in uncertainty, fear or catastrophic beliefs (Ferreira et al. 2010; Mannion et al. 2013). However, there is also some indication that patients' attitudes and beliefs about their MSK pain are associated with those of the HCP with whom they have consulted. For example, in a survey of the beliefs about LBP of the general population and HCPs in Norway, Werner et al (2005) found corresponding patterns of belief in the self-limiting nature of LBP between different HCP groups and the individuals who sought their care. Individuals who

did not seek healthcare were the group most likely to believe LBP would spontaneously recover. However, the authors acknowledge that there is no way of knowing whether patients' beliefs are consequent to their interaction with an HCP, or if pre-existing beliefs influence the decision to seek care from an HCP with similar belief (Werner et al. 2005).

2.5.3 The influence of healthcare practitioner's attitudes and beliefs

A number of potential mechanisms through which HCPs' attitudes and beliefs may influence those of their patients have been proposed. The aspects of clinical behaviour which have been implicated include: the extent to which a clinician explores (and if appropriate) challenges patient beliefs, the nature of information and advice provided, the choice and duration of treatment.

The results of a range of studies suggest that many MSK HCPs do, in principle or in part, identify psychological or social factors as pertinent to the management of MSK pain (Harding et al 2010, Sanders et al 2013). However it is also clear that this theoretical acknowledgement is not widely translated into practice. Two recent observational studies of Belgian and Dutch physiotherapists' initial consultations with patients with LBP or neck pain found that their assessment focussed on physical elements and that psychological and social dimensions were inadequately covered (Oostendorp et al. 2015; Roussel et al. 2015). In addition, Oostendorp et al (2015) report a substantial discrepancy between the physiotherapists' actual and self-reported use of biopsychosocial history taking; indicating that HCPs may either be unaware of deficiencies in their practice or for some reason chose not to, or were unable to explore these elements further.

Studies of the reasons that HCPs feel unable or unwilling to fully adopt a biopsychosocial clinical approach have returned a number of key themes. These include: poor

understanding of the role of psychosocial factors in patients' clinical presentation, lack of clarity about their assessment, lack of training and confidence and time constraints (Singla et al. 2015, Synnott et al 2015, Driver et al 2016). In addition, HCPs' attitudes and beliefs, or clinical orientation, have been demonstrated to be associated with several aspects of their clinical behaviour (Darlow et al 2012). As a consequence of HCPs' failure to implement biopsychosocial practice and guidelines, patients' attitudes and beliefs may not be assessed and maladaptive beliefs may at best go unchallenged and at worst be reinforced (Pincus 2012, Darlow et al 2016).

It has also been found that HCPs' persist in using biomedical and structural-pathological language and explanations when providing patients with information about diagnoses and their rationale and expectations for treatment (Daykin and Richardson 2004, Zusman 2013, Darlow et al 2016). In addition, HCPs continue to focus on physical aspects of assessment and do not routinely consider the contribution of psychosocial factors (Beales et al 2016). A substantial body of work has examined the relationship between HCPs' attitudes and beliefs and their provision of appropriate, guideline adherent advice about activity and work**.** HCPs' who hold biomedical or fear avoidant attitudes and beliefs have repeatedly been found to advise rest and avoidance of activity and work for patients with common MSK pain (Rainville et al 2000, Bishop et al 2008, Pincus et al 2011).

The information provided by HCPs has an enduring impact on their patients (Darlow et al 2014), potentially reinforcing structural-pathological beliefs and perceptions of vulnerability, reinforcing pain behaviour, delaying the resumption of activity and reducing their recovery expectations (Briggs et al 2010). Similarly, despite the publication of many biopsychosocial clinical practice guidelines, HCPs continue to deliver predominantly

biomedical, or structural-pathological focussed and non-guideline adherent management for common MSK pain conditions (Mafi et al 2013, Amorin-Woods et al 2014). Although the relationship between HCPs' attitudes and beliefs and these aspects of their clinical behaviour is well established, far less is known about the extent to which HCPs' attitudes and beliefs can be changed, whether this changes their clinical behaviour and whether or not this impacts on patient outcome. Although there is some support for the efficacy of biopsychosocial educational interventions in changing HCP's attitudes and beliefs (Vonk et al 2009, O'Sullivan et al 2012) a sustained impact on their clinical behaviour has not been demonstrated (Overmeer et al 2009).

This area of research is to an extent limited by the inherent difficulties associated with the study of attitudes and behaviour. An incongruence between self-reported and actual clinical practice has been frequently observed (Brunner et al. 2015) and a number of explanations for it have been proposed. These include social desirability response bias and the inability of proxy measures of clinical behaviour, such as clinical vignettes, to capture the contextual influences on clinical behaviour, for example the interaction with patients (Brunner et al. 2015).

2.6 Measurement of attitudes and beliefs

The fundamental challenge with measuring attitudes and beliefs is that they are not directly observable (Krosnick et al. 2005). This is the case for many of the constructs pertinent to the study of health and healthcare, such as pain or satisfaction (Streiner et al. 2015) which do not have overt, unambiguous or direct manifestations (DeVellis 2006). Established methods have been developed in the fields of psychology and education using proxy

indicators that provide information about the latent, underlying construct of attitude (John & Benet-Martinez 2000).

The relationship between the observed items and unobserved/latent construct is described by a conceptual framework which can be either reflective or formative. In a formative measurement model, the items are determinants of the unobserved construct whereas in a reflective model the underlying construct is manifest in the items, and a change in the construct will affect the items (de Vet et al. 2011).

Using effect indicators to make inferences about an underlying construct, such as attitude, is an imperfect process and several different measurement approaches have been developed to determine the extent to which proxy indicators accurately represent the unobserved variable. The most widely used approach for testing reflective models is classical test theory (CTT) (Streiner et al. 2015). CTT comprises a set of principles that allow the extent to which the proxy indicators estimate the unobserved variable to be determined (Streiner et al. 2015). At the heart of CTT is the principle that an observed score (on a scale or an item) represents the 'true' value of the unobserved (latent) variable plus the error contributed from all other influences on the observable variable (de Vet et al. 2011).

$Y = \eta + \varepsilon$

(where Y = the observed score, η = the 'true' score and ε = error term of measurement).

Despite the fact that psychometrics is a well-established discipline and the principles are widely utilised, a recognised lack of clarity in the literature about the terminology and definitions (de Vet et al 2005) led to the development of the COSMIN initiative (COnsensus-

based Standards for the selection of health Measurement INstruments). This consensus process was conducted with an international multidisciplinary team of researchers with the aim of improving the selection of outcome measurement instruments both in research and in clinical practice by developing tools for selecting the most appropriate available instrument (Mokkink et al. 2010).

The resultant taxonomy includes nine measurement properties clustered within three domains - reliability, validity and responsiveness - which were considered relevant in the evaluation of outcome measurement instruments. These are detailed in full in Box 2.1. Although there has been a recent increase in the use of an alternative psychometric approach, item response theory (IRT), CTT can be as effective and the techniques are accessible and familiar (DeVellis 2006); and allow comparison with existing studies which have utilised CTT. A CTT approach will therefore be employed and the COSMIN definitions and standards will be applied to this scale development process.

Reliability Domain

The extent to which scores for patients who have not changed are the same for repeated measurement under several conditions

- **Internal consistency**
  The degree of the interrelatedness among the items
- **Reliability**
  The proportion of the total variance in the measurements which is due to 'true' differences between patients
- **Measurement error**
  The systematic and random error of a patient's score that is not attributed to true changes in the construct to be measured

Validity Domain

The degree to which an HR-PRO instrument measures the construct(s) it purports to measure

- **Content validity**

The degree to which the content of an HR-PRO instrument is an adequate reflection of the construct to be measured

- **Construct validity**

The degree to which the scores of an HR-PRO instrument are consistent with hypotheses *(for instance with regard to internal relationships, relationships to scores of other instruments, or differences between relevant groups)* based on the assumption that the HR-PRO instrument validly measures the construct to be measured

  - **Structural validity**
    The degree to which the scores of an HR-PRO instrument are an adequate reflection of the dimensionality of the construct to be measured
  - **Hypothesis testing**
    Define relationships – convergent, discriminant or known groups
  - **Cross-cultural validity**
    The degree to which the performance of the items on a translated or culturally adapted HR-PRO instrument are an adequate reflection of the performance of the items of the original version of the HR-PRO instrument

- **Criterion validity**

The degree to which the scores of an HR-PRO instrument are an adequate reflection of a 'gold standard'

Responsiveness Domain

The ability of an HR-PRO instrument to detect change over time in the construct to be measured

Interpretability Domain

Interpretability is the degree to which one can assign qualitative meaning - that is, clinical or commonly understood connotations – to an instrument's quantitative scores or change in scores

Box 2.1 Taxonomy and definitions (Mokkink et al 2010; de Vet et al 2011)

2.7 Existing measures of HCPs' attitudes and beliefs about common MSK pain

A number of measurement tools have been developed for use in the study of HCPs' attitudes and beliefs about MSK pain. A review published in 2007 (Bishop et al. 2007) identified five existing self-report measures of HCPs' attitudes and beliefs about LBP: The Health Care Provider's Pain and Impairment Relationship Scale (HC-PAIRS) (Rainville et al. 1995), the Fear Avoidance Beliefs Questionnaire (FABQ) (Waddell et al. 1993) adapted for HCPs, a fear avoidance (FA) beliefs tool (Linton et al. 2002), Attitudes to Back Pain Scale in Musculoskeletal Practitioners (ABS-mp) (Pincus et al. 2007) and the Pain Attitudes and Beliefs Scale (PABS) (Ostelo et al. 2003). In addition, the Back Beliefs Questionnaire for HCPs (BBQ-HC) (Houben et al. 2005) and the Tampa Scale of Kinesiophobia for HCPs (TSK-HC) were adapted from the original patient versions with only minor changes to item wording for use with HCPs (Symonds et al. 1996; Kori et al. 1990). Details of tools are provided in table 2.1. The majority of these tools are either direct adaptations of existing measures of patient attitudes and beliefs, principally concerning LBP; or are heavily informed by the same.

Four of the tools are direct adaptations of patient measures – the PAIRS (Riley et al. 1988), a measure of expectation for function with LBP, the TSK (Kori et al. 1990), the FABQ (Waddell et al. 1993) and BBQ (Symonds et al. 1996). In all cases, the adaptations for use with HCPs was minimal, consisting of nothing more than a slight change in wording and without relevant HCP stakeholder involvement and therefore their validity (face and content) for HCPs is questionable (de Vet et al. 2011). Both the FA beliefs tool and the PABS were composites of items derived from several patient measures and items developed by the authors. However, in none of the six measures were these new items the product of a formal conceptualisation process. The only tool which has been developed from the outset

as a measure of HCPs' attitudes is the ABS.mp. The items for this scale were derived from a previous interview study of chiropractors, osteopaths and physiotherapists concerning the extent to which and reasons why they might continue to treat patients with LBP which was not improving (Pincus, Vogel, Santos, et al. 2006). Although this process provides a degree of face validity, this measure is not based on a formal conceptualisation of HCPs attitudes and beliefs about MSK pain. A clear conceptualisation, or an explicit definition, of the construct to be measured is an essential prerequisite in the scale development process (de Vet et al. 2011) and all of these measures lack the required conceptual validity and therefore it is not known whether they provide an accurate and comprehensive representation of HCPs attitudes and beliefs to MSK pain. Bishop et al. (2007) concluded that the development of measures of HCPs' attitudes and beliefs (about LBP) was still in "its infancy" (p. 98).

The PABS is the most widely tested and used of the available measures. However in their more recent systematic review, Mutsaers et al. (2012), concluded that although the results of the PABS psychometric properties were promising, the PABS is still very much in a developmental stage. The next section will provide a more detailed discussion of the psychometric properties of the PABS.

Table 2.1 Characteristics and measurement properties of current measures of HCPs' attitudes and beliefs		
HC-PAIRS	**FORMAT:** 15-item version or 13-item version covering 4 domains: functional expectations, social expectations, need for cure, projected cognitions. Items in the 15-item version scored on a 7-point Likert agreement scale sand items on the 13-item version scored on a 6-point Likert agreement scale; assesses clinicians' beliefs about the relationship between chronic LBP and function. Higher scores indicate stronger belief that pain and disability are directly associated and that disability and avoidance of activities are inevitable consequences of pain	
	ORIGIN AND DEVELOPMENT: developed in USA by Rainville et al (1995), adapted from the PAIRS (Riley et al 1988), items were changed from the first person to refer to chronic LBP patients; re-evaluation by Houben et al. (2004)	
	USES AND ADAPTATION: used in studies of family physicians, OTs, PTs, chiropractors, spinal surgeons, nurses	
	RELIABILITY	Internal consistency: original 15 items version reported as Cronbach's alpha=0.78 (Rainville et al. 1995); amended 13-item version Cronbach's alpha = 0.84 (Houben et al. 2004).
		Test-retest reliability: moderate correlation (r= 0.64, p<0.001) (Rainville et al. 2000)
	VALIDITY	Structural: initial 4 factor structure proposed, re-evaluation by Houben et al. 2004 proposed a single factor solution and the removal of 2 weaker items.
		Hypothesis testing: scores on HC-PAIRS correlate with those of the TSK-HCP and PHODA-HCP (Houben et al. 2005); and with recommendations given by HCPs concerning work and activity (higher scores associated with being more likely to advise time off work or avoidance of activity) (Houben et al. 2004). Scores on HC-PAIRS reported as differentiating between two groups of HCPs, those with and without specific training in functional rehabilitation, and found statistically significant differences between the groups (Rainville et al. 1995).
		Cross-cultural: translated into Brazilian-Portuguese, Chinese, Dutch, Spanish
	RESPONSIVENESS: Latimer et al. (2004)	
	INTERPRETABILITY: no information	
BBQ-HC	**FORMAT:** consists of 9 inevitability statements assessing an individual's belief about various inevitable consequences of LBP. Items are scored using a 5-point Likert agreement score.	
	ORIGIN AND DEVELOPMENT: adapted from the original patient version of the BBQ (Symonds et al, 1996) only minor changes to item wording for use with HCPs.	
	USES AND DEVELOPMENT: the patient version of the BBQ is consistently used, no formal development for use with HCPs	
	RELIABILITY: no information available	
	VALIDITY	Structural validity: no information available
		Hypothesis testing: no information available

	Cross-cultural validity: patient version translated for use with HCPs into Chinese and French	
	RESPONSIVENESS: no information available	
	INTERPRETABILITY: no information available	
FABQ for HCPs	**FORMAT:** 11 items covering 2 dimensions; 1) fear avoidance beliefs about activity and 2) fear avoidance beliefs about work; items scored using a 7-point Likert agreement scale.	
	ORIGIN AND DEVELOPMENT: adapted in France from the original patient version of the FABQ (Waddell et al. 1993) by Coudeyre et al. (2006) and Poiraudeau et al. (2006), the only adaptation made to the original items was removing the word 'other' from the first sentence of the instructions 'these are statements other patients have expressed about their LBP'.	
	USES AND ADAPTATIONS: French rheumatologists and GPs	
	RELIABILITY: no information available	
	VALIDITY	Structural validity: no information available
		Hypothesis testing: HCPs with higher scores on the measure were found to be more likely to advise bed rest or sick leave for patients with LBP (Coudeyre et al. 2006) and less likely to advise maintaining maximum bearable activities during sick leave (Poiraudeau et al. 2006).
		Cross-cultural validity: no information available
	RESPONSIVENESS: no information available	
	INTERPRETABILITY: no information available	
TSK-HCP	**FORMAT:** 17 items rated on a 6-point Likert scale ranging from "totally disagree" to "totally agree"	
	ORIGIN AND DEVELOPMENT: adapted from the original patient version of the TSK (Kori et al. 1990) for use with HCPs in the validation of the HC-PAIRS (Houben et al. 2004), only minor changes to item wording for use with HCPs.	
	USES AND DEVELOPMENT: the patient version of the TSK is consistently used, no formal development for use with HCPs	
	RELIABILITY: no information available	
	VALIDITY	Structural validity: no information available
		Hypothesis testing: no information available
		Cross-cultural validity: no information available
	RESPONSIVENESS: no information available	
	INTERPRETABILITY: no information available	
FA BELIEFS TOOL	**FORMAT**: 14 items measuring a single domain of fear avoidance; items scored using a 6-point Likert agreement scale.	
	ORIGIN AND DEVELOPMENT: developed in Sweden by Linton et al. (2002), first tool purposively developed to measure HCPs attitudes and beliefs towards MSK pain. Designed to explore the relationship between attitudes and self-reported clinical behaviour. Although	

	the tool was conceptualised for use with HCPs, it drew heavily on existing measures of patients fear avoidance beliefs. Items taken from the TSK, the FABQ and the PAIRS were supplemented by items developed by the authors concerning beliefs about sick leave as a treatment for LBP.	
	USES AND ADAPTATIONS: used in groups of Swedish primary care physicians and PTs	
	RELIABILITY: internal consistency – insufficient testing. Internal consistency in a convenience sample of 113 Swedish physicians and therapists using only the two items measuring the belief that psychosocial factors are related to back pain (Linton et al. 2002).	
	VALIDITY	Structural validity: no available information
		Hypothesis testing: Higher scores on the tool were associated with considering sickness absence as a good treatment for LBP and not providing patients with information about activity (Linton et al. 2002)
		Cross-cultural validity: no information available. Developed in Sweden but items taken from English language.
	RESPONSIVENESS: no available information	
	INTERPRETABILITY: no available information	
PABS	**FORMAT:** PABS comprises 2 scales measuring biomedical and biopsychosocial clinical orientation. Item membership of both scales has fluctuated although the 19-item version proposed by Houben et al (2005), which is the most widely used version, has 10 biomedical items and 9 biopsychosocial items. Items scored on a 6-point Likert agreement scale	
	ORIGIN AND DEVELOPMENT: originally developed in the Netherlands as the PABS-PT by Ostelo et al 2003 as a measure of 2 theoretically derived treatment orientations of PTs towards chronic LBP. The PABS is a composite of items drawn from the patient versions of the TSK, the BBQ and the FABQ (adapted for use with HCPs) and items developed by the authors to capture clinical elements. Additional items were developed by Houben et al (2005) in an attempt to strengthen the scale	
	USES AND ADAPTATIONS: used in studies of GPs, PTs, chiropractors, nurses, pharmacists; also used in studies of common or non-specific LBP, NP, whiplash, knee pain, general MSK pain and general chronic pain	
	RELIABILITY	**Internal consistency:** Cronbach's alpha for the biomedical scale range from 0.72 to 0.84 (Dalkilinc et al. 2014; Ostelo et al. 2003) and for the biopsychosocial scale range from 0.54 to 0.73 (Ostelo et al. 2003; Mutsaers et al. 2014)
		Test-retest reliability: ICCs for the biomedical scale range from 0.73 to 0.81 (Mutsaers et al. 2014; Bowey-Morris et al. 2010) and for the biopsychosocial scale 0.65 to 0.82 (Bowey-Morris et al. 2010; Mutsaers et al. 2014)
	VALIDITY	**Structural validity:** numerous studies have confirmed a 2 factor structure using EFA (Laekeman et al. 2008; Dalkilinc et al. 2015; Mutsaers et al. 2014, Bishop et al. 2008, Eland et al. 2016)
		Hypothesis testing: clinicians who score more highly on the biomedical scale have consistently been found to recommend time off work or rest for back/MSK pain (Houben et al. 2005, Bishop et al. 2008). PTs who are biomedically trained scored more highly on the biomedical sale than those who attended biopsychosocial courses (Osetelo et al.

		2003) whereas HCPs who had biopsychosocial training were found to score more highly on the biopsychosocial scale (Rebbeck et al. 2013; Jacobs et al. 2015; Beneciuk & George 2015). The PABS was found to be associated with other measures of similar constructs i.e. TSK-HC, PHODA (Houben et al. 2005)
		Cross-cultural validity: original Dutch version translated into English, Portuguese, Brazilian Portuguese, Norwegian, German; Japanese, Turkish
	RESPONSIVENESS: Vonk et al. (2009), Overmeer et al. (2009), Bowey-Morris (2010), Jacobs et al. (2015), Beneciuk & George (2015)	
	INTERPRETABILITY: no information available	
ABS.mp	**FORMAT:** 19 items covering 6 domains: limitations on sessions, psychological, connection to healthcare system, confidence and concern, re-activation and biomedical. Items are scored on a 7-point Likert agreement scale.	
	ORIGIN AND DEVELOPMENT: developed in the UK by Pincus et al (2006) to assess the impact of practitioner attitudes (to LBP, on clinical practice, training needs and outcome). Items were developed from semi-structured interviews with 42 HCPs and grouped into meta-themes: personal interaction attitudes and treatment orientation attitudes.	
	USES AND ADAPTATIONS: used with chiropractors, osteopaths and physiotherapists based in UK private care and NHS settings	
	RELIABILITY: no information available	
	VALIDITY	**Face and content validity:** 14 practitioners reported that face validity was good. Most of the practitioners thought the tool covered all relevant areas (Pincus et al. 2006).
		Structural validity: CFA supported a 6-factor structure.
		Hypothesis testing: no information available
		Cross-cultural validity: no information available. Developed in English, has not been translated into other languages
	RESPONSIVENESS: no evidence	
	INTERPRETABILITY: no evidence	

Notes: PHODA=Photographic Series of Daily Activities; CFA=Confirmatory factor analysis; UK=United Kingdom; HC-PAIRS=Health Care Provider's Pain and Impairment Relationship Scale; FABQ=Fear Avoidance Beliefs Questionnaire; FA=Fear avoidance; ABS-mp=Attitudes to Back Pain Scale in Musculoskeletal Practitioners; PABS=Pain Attitudes and Beliefs Scale; BBQ-HC=Back Beliefs Questionnaire for HCPs; TSK-HC=Tampa Scale of Kinesiophobia for HCPs; LBP= Low back pain; HCP=Health Care Providers

2.8 The Pain Attitudes and Beliefs Scale

2.8.1 Development and amendment of the PABS

The Pain Attitudes and Beliefs Scale for Physiotherapists (PABS-PT) was developed in the Netherlands to evaluate the attitudes and beliefs of physiotherapists towards the management of patients with chronic LBP (Ostelo et al. 2003). The developers first reviewed existing questionnaires measuring patients' attitudes and beliefs towards chronic LBP. Eight items from the Tampa Scale of Kinesiophobia (TSK) (Kori et al. 1990), two from the Back Beliefs Questionnaire (BBQ) (Symonds et al. 1996), and two from the Fear Avoidance Beliefs Questionnaire (FABQ) (Waddell et al. 1993) were extracted and rephrased to reflect a therapist's point of view. The basis for selecting these items is not clear. They then added an additional 19 items they considered relevant to the management of LBP, though again it is unclear how these additional items were derived. Finally an expert panel, consisting of several physiotherapists with expertise in cognitive behavioural approaches and researchers in the field of chronic pain, checked that the items were unambiguous and discriminated between biomedical and biopsychosocial treatment orientations. Principal factor analysis yielded two factors in a cohort of 421 Dutch physiotherapists. The final "biomedical orientation" scale consisted of 14 items with low explained variance (25.2%). Internal consistency of the biomedical scale was good (Cronbach's alpha = 0.84). The "behavioural orientation" scale consisted of 6 items with a very low explained variance (8.2%). Internal consistency of the biomedical scale was poor (Cronbach's alpha = 0.54). When initially describing the target treatment orientations for the PABS, Ostelo et al (2003) identify that the behavioural treatment approach was informed by the biopsychosocial model of chronic LBP (CLBP), and the behavioural scale of

the PABS has become synonymous with, and is also referred to as, the psychosocial or biopsychosocial scale in the literature (Watson et al. 2008; Mutsaers et al. 2014). For the purpose of this review of the psychometric properties of the PABS, the term biopsychosocial will be used to describe the scale, and will continue to be adopted when discussing the developmental work conducted for this thesis.

In order to strengthen the behavioural scale in particular, further validation and revision was undertaken by Houben et al. (2005). Five additional items, aimed at enhancing the behavioural scale, were added to the original 31 items. It is unclear how these items were developed. The additional items were reviewed by the same expert group used by Ostelo et al (2003). Further analysis examined the factor structure, the internal consistency and construct validity compared with the TSK-PT, BBQ-HC, the HC-PAIRS and the PHODA. This resulted in an improved 19 item (see Appendix 1), two factor tool for the assessment of HCPs' attitudes and beliefs consisting of a 10-item biomedical scale (explained variance 23.4%, Cronbach'salpha = 0.8) and a 9-item behavioural scale (explained variance = 10%, Cronbach's alpha = 0.68). This suggests that for the 19-items PABS, despite continued low explained variance, both scales have increased and satisfactory reliability.

Encouraged by recommendations from the developers there have been numerous attempts to explore the structure of the PABS based on an extended pool of 31 or 36 items. These studies have consistently resulted in a two-factor structure but with considerable variation in the item composition of both scales, with the limitation that the scale is not standardised or generalisable. The PABS has since been used in numerous HCP groups, in several different pathology groups, different countries and healthcare settings and has

been translated into English, Dutch, German, Brazilian Portuguese, Turkish, Japanese and Norwegian. The 19-item version of Houben et al (2005) has become the most widely used version utilised in research of HCPs' attitudes and beliefs. HCPs are asked to rate statements about treatment preferences on a 6-point Likert scale (1 = Totally disagree, 6 = Totally agree). The scores for the two scales are evaluated individually and not summed. Minimum and maximum scores for each subscale vary dependent on the version of the scale being used and for the 19-item version range from 10 to 60 for the biomedical scale and 9 to 54 for the biopsychosocial scale.

Several limitations are evident within this development sequence. Firstly the adaptations of items from patient measures, the unclear author-led process of developing additional new items indicate that the PABS has not undergone a clear grounded conceptualisation process or involved relevant stakeholders in the process of developing new items; these factors may explain the low levels of explained variance for both scales, particularly the biopsychosocial scale. Originally developed for measuring physiotherapist attitudes about CLBP, the PABS has since been adapted for use in NP (Vonk et al. 2009), whiplash (Rebbeck et al. 2013) and knee pain (Holden et al. 2009). All these adaptations describe substituting the relevant region for any reference to 'back pain' in the scale items.

2.8.2 Summary of the psychometric properties of the PABS

The psychometric properties of the PABS are discussed below and summarised in table 2.2.

2.8.2.1 Existing review(s) of the psychometric properties of the PABS

Two good quality systematic reviews have reviewed the PABS (Bishop et al. 2008; Mutsaers et al. 2012). A comprehensive review of the psychometric properties of the PABS was

conducted by Mutsaers et al. (2012), whilst Bishop et al. (2008) reviewed all available measures of HCPs attitudes and beliefs. Both reviews undertook extensive literature searches in multiple databases, employed independent reviewers to identify relevant studies and extract data. Both authors employed a relevant protocol for the assessment of measurement tools. Mutsaers et al. (2012) employed the COSMIN checklist and procedures (Mokkink & Terwee 2010) to evaluate the methodological quality of the investigation of each measurement property in the included studies. Bishop et al. (2008) adopted the review criteria developed by the Scientific Advisory Committee of the Medical Outcomes Trust (Lohr et al. 1996). In both studies the quality of each measurement property was subsequently rated on either a four-point scale ('poor', 'fair', 'good' or 'excellent') (Mutsaers et al. 2012) or a five point scale (extensive, adequate, limited, none, or unknown (Bishop et al. 2008). Bishop et al. (2008) identified 3 studies indicating a limited reporting on the validity and reliability of the PABS. Mutsaers et al. (2012) located 10 studies investigating the psychometric properties of the PABS. Both sets of reviewers concluded that the PABS was promising, and that the available evidence on the measurement properties of the PABS was positive. The key limitations of the PABS included relatively poor internal consistency of the biopsychosocial scale, limited evidence for test-retest reliability and responsiveness, no evidence of content validity or interpretability. The reviews concluded that the PABS remains in a developmental stage and that further development and testing was required.

Table 2.2: Summary of PABS measurement properties

		Biomedical Scale	Biopsychosocial scale
Reliability	Internal consistency (IC)	Cronbach's alpha range from 0.74 to 0.84 across all versions. IC consistently exceeds the preferred level of 0.7	Cronbach's alpha range from 0.54 to 0.73 across all versions. In all but one study, IC < 0.7 indicating that IC is sub-optimal
	Test-retest reliability	ICC consistently exceed preferred level of 0.7	ICC consistently exceed preferred level of 0.7
	Measurement error	Insufficient testing	Insufficient testing
Validity	Face/content	No evidence	No evidence
	Structural	Consistent single dimensional; scale performs well regardless of item composition	Consistent single dimension structure identified, but none of the versions performs well.
	Hypothesis testing	No evidence	No evidence
	Cross-cultural validity	Original Dutch and English versions of the PABS presented simultaneously by Dutch developers. No evidence of high quality translation or cultural adaptation. Subsequent cultural-validation of the English version to German, French, Brazilian-Portuguese, Turkish, Japanese and Norwegian. A poor quality Swedish version also exists.	
Responsiveness	Responsiveness	No evidence of responsiveness	No evidence of responsiveness

2.8.2.2 Reliability

Internal consistency

Cronbach's alpha values of 0.60 or greater are considered to indicate an acceptable degree of internal consistency within a scale, however values greater than 0.70 are preferable (Nunnally & Bernstein 1994). Across all versions of the PABS, the biomedical scale has routinely demonstrated good internal consistency with values of Cronbach's alpha ranging from 0.74 (Magalhaes et al. 2011) to 0.84 (Ostelo et al. 2003) reported in validation studies of LBP, NP (Mutsaers et al. 2014), knee pain (Holden et al. 2009) and cross-cultural validation studies (Magalhaes et al. 2011; Magalhaes et al. 2012). The consistency of these findings across different populations, language versions and body regions provides strong

evidence that the biomedical scale is internally consistent. One limitation of the biomedical scale is that exploration of the structure of the PABS has been undertaken in extended pools of either 31 or 36 items and across different MSK conditions and HCP groups. This has led to considerable variation in its composition and therefore item membership of a standardised biomedical scale has yet to be established.

The biopsychosocial scale has largely performed poorly with studies included in the systematic review by Mutsaers et al (2012) reporting values of Cronbach's alpha ranging from 0.54 (Ostelo et al. 2003) to 0.68 (Houben et al. 2005) and therefore falls below the preferred threshold of 0.7 (Nunnally & Bernstein 1994). One recent notable exception which did achieve good levels of internal consistency (Cronbach's alpha = 0.73) was the study by Mutsaers et al (2014) testing the factor stucture of an amended version of the PABS for NP. The emergent composition of this scale was somewhat different from that seen in previous versions of the scale for LBP. In addition only 182 HCPs participated in this study (Mutsaers et al. 2014), which is considered low for exploratory factor analysis (EFA), and this might have affected the stability of the factor structure (Field 2009; de Vet et al. 2005). The relative instability of the biopsychosocial scale may be due to the complexity of the biopsychosocial approach compared with the biomedical approach, making it hard to pin down the construct (Mutsaers et al. 2012).

In summary, the biomedical scale is more robust and stable than the biopsychosocial scale, however it has been suggested that the inconsistent item composition of both scales across different studies indicates that the PABS is still in its developmental stage (Mutsaers et al. 2012). The inconsistent and generally unsatisfactory internal consistency of the

biopsychosocial scale in particular has led to calls for its redevelopment (Watson et al. 2008; Bishop et al. 2008).

Test- retest reliability

Typically, an intraclass correlation co-efficient (ICC) of 0.7 is considered to indicate acceptable reliability for a scale (Nunnally & Bernstein 1994). Four studies have used an ICC to investigate the test-retest reliability of different versions of the PABS, in different languages and in different HCP groups. The methodological details and results if these studies are summarised in table 2.3.

Table 2.3: Summary of studies reporting ICCs in the investigation of test-retest reliability of the PABS

Study	-Version of PABS -HCP population surveyed -Target MSK condition	ICC for biomedical scale (95% CI where cited)	ICC for biopsychosocial scale (95% CI where cited)
Bishop et al. 2008	-19 item PABS -UK-based GPs and PTs (primary and secondary care) -NS-LBP	GPs – 0.78 PTs – 0.82	GPs – 0.73 PTs – 0.76
Bowey-Morris et al. 2010	-17 item PABS-GP -GPs in Jersey, UK -LBP	0.81 (0.71 - 0.88)	0.65 (0.50 - 0.77)
Magalhaes et al. 2011	-Brazilian-Portuguese version of the 19 item PABS-PT -Brazilian PTs -CLBP	0.80 (0.72 - 0.87)	0.70 (0.57 - 0.94)
Mutsaers et al. 2014	-15 item PABS-PT -Dutch PTs -Neck pain	0.73 (0.56 - 0.83)	0.82 (0.71 - 0.89)

Notes: CI=confidence interval, GP=General Practitioner, HCP=Healthcare Practitioner, ICC=intraclass correlation coefficient, PABS = Pain Attitude and Beliefs Scale, PT= Physiotherapist, UK=United Kingdom, NS- or CLBP=non-specific or chronic low back pain

These studies have generally produced adequate levels of test-retest reliability for the biomedical scale with ICCs in excess of 0.7 (Bowey-Morris et al. 2010; Magalhaes et al. 2011; Mutsaers et al. 2014; Bishop et al. 2008); ranging from 0.73 (Mutsaers et al. 2014) to 0.82 (Bishop et al. 2008). Values for the biopsychosocial scale range from 0.65 to 0.82 (Bowey-Morris et al. 2010; Mutsaers et al. 2014) with all but one being greater than or equal to 0.7 indicating adequate levels of agreement. Laekeman et al (2008) examined the test-retest reliability of the German version of the PABS with a Pearson's correlation coefficient, which is considered an inappropriate measure of reliability as it represents the strength of linear association and not agreement between scores (Rankin & Stokes 1998).

The results of these studies suggest that the biomedical scale demonstrates greater test-retest reliability than the biopsychosocial scale (Bowey-Morris et al. 2010; Magalhaes et al. 2011; Bishop et al. 2008). The only result to differ from this trend is once again from the adaptation of the PABS for use in NP where ICCs of 0.73 and 0.82 are reported for the two scales respectively (Mutsaers et al. 2014).

Measurement error

Measurement error has been investigated in four studies of the PABS (Bowey-Morris et al. 2010; Magalhaes et al. 2011; Mutsaers et al. 2014; Bishop et al. 2008). Three of these use Bland-Altman plots to illustrate the 95% limits of agreement (LoA) for both scales of the PABS, although the range of agreement varies across the three. The LoA reported by Bowey-Morris et al. 2010, Bishop et al. 2008 and Mutsaers et al 2014 for the biomedical scale were -8.99 and 8.60, -9.18 and 6.86, -11.91 and 11.05 respectively; and -4.52 and 3.82, -7.33 and 6.97, -7.35 and 7.43 for the biopsychosocial scale. Maghalhaes et al (2011)

reported the standard error of measurement (SEM) of the biomedical and biopsychosocial subscales of the Brazilian Portuguese version of the PABS as 3.57 and 3.48 respectively (percentage of total score = 7.1 and 7.7). Mutsaers et al (2014), in their test of the PABS amended for NP, reported the SEM for the biomedical and biopsychosocial subscales as 3.01 and 1.58 respectively and the smallest detectable change (SDC) as 8.34 and 4.37. Bishop (2008) reported that the SEM of the PABS scales is similar for both scales and for both physiotherapists and GPs. The SDC (individual) of 7 points for the GPs and 7 to 9 points for the physiotherapists and the SDC group ranged from 0.59 to 0.8. In summary, reporting of measurement error has been variable with a general lack of studies investigating this property.

2.8.2.3 Validity

Face/content validity

No studies were identified that explicitly explored either face or content validity. The developers (Ostelo et al. 2003; Houben et al. 2005) did use an expert panel to review items for their ability to discriminate between biomedical and biopsychosocial treatment orientations. However there is no evidence that this panel were asked to consider whether the scales adequately reflected biomedical or biopsychosocial treatment orientation (Mokkink, Terwee, Patrick, et al. 2010). Since no formal conceptualisation of the biomedical and biopsychosocial treatment orientation was undertaken prior to the development of the scale it is not possible to evaluate content validity. Because of the complexity of biopsychosocial treatment orientation in particular (Mutsaers et al. 2012), a

clear theoretical conceptualisation of the construct would allow better selection of items which adequately reflect that construct (de Vet et al. 2011). A process of conceptualisation of the biopsychosocial treatment orientation is likely to enhance both face and content validity.

Structural validity

Since the initial development and amendment of the PABS detailed above (Ostelo et al. 2003; Houben et al. 2005), numerous studies have explored the factor structure of the PABS (Laekeman et al. 2008; Dalkilinc et al. 2015; Mutsaers et al. 2014; Bishop et al. 2008; Eland et al. 2016). The two factors of the PABS has been replicated in all subsequent analyses using exploratory factor analysis (EFA), though none of the studies has used confirmatory factor analysis (CFA) to confirm the structure. All but one study (Bishop et al. 2008) have used either the initial 31 (Ostelo et al. 2003) or 36 (Houben et al. 2005) item pool to investigate the factor structure, and have all produced scales of varying length and item composition. Mutsaers et al. (2014) note that in all existing studies of the PABS only 4 items have consistently featured on the biomedical subscale and not a single biopsychosocial item has featured consistently. One limitation of the PABS is that it is not standardised thus making comparison between studies difficult.

In summary, the biomedical scale appears to create a coherent, interpretable scale regardless of which biomedical items come together. The item composition of the biopsychosocial scale is more fluid, with very few items loading strongly enough to create a 'strong' factor and whatever the composition, none of the versions form a robust scale.

One explanation for this is that the 36 item pool is potentially limited and drawn from a narrow body of literature and the biopsychosocial scale is therefore likely to be missing important representative items and may be incomplete in unknown ways (Buchbinder et al. 2011).

Hypothesis testing

The basic tenet of building construct validity is that hypotheses regarding the relationship of PABS scores with other related and unrelated constructs are tested (de Vet et al. 2011). Clear recommendations for hypothesis testing have been proposed by the COSMIN initiative which includes the development of a priori hypotheses, description of the related or unrelated constructs, expected magnitude and direction of the relationship (Mokkink, Terwee, Patrick, et al. 2010). To date, no study using the PABS has met these exacting requirements for robust hypothesis testing.

However, there is a degree of consistency in the findings of studies examining the relationship between HCPs' scores on the PABS and various clinical behaviours, other measures of attitudes and beliefs and factors which have been associated with HCPs' attitudes and beliefs, such as their education and training. For example higher scores on the biomedical scale have been associated with advising rest from activity and work (Houben et al. 2005; Bishop et al. 2008; Laekeman et al. 2008; Fullen et al. 2011), rating the severity of pathology more highly (Derghazarian & Simmonds 2011), clinical judgements of severe spinal pathology (Simmonds et al. 2012) and adherence to clinical guidelines (Fullen et al. 2011). Scores on the biomedical subscale were found to be substantially associated

with TSK and HC-PAIRS scores (Houben et al. 2005). Physiotherapists who were largely biomedically trained scored more highly on the biomedical scale than those who had attended biopsychosocial courses (Ostelo et al. 2003), whereas HCPs who had biopsychosocial training were found to score more highly on the biopsychosocial scale and have lower scores on the biomedical scale (Rebbeck et al. 2013; Jacobs et al. 2015; Beneciuk & George 2015).

In summary, although robust, a priori hypothesis testing has yet to be undertaken with the PABS, these studies provide a cumulative insight into the relationships between the PABS scales and a range of related constructs; and which is generally supportive of its construct validity.

Cross-cultural validity

Cross cultural validity is the degree to which a translated or culturally adapted scale adequately reflects the performance of the original scale (Mokkink, Terwee, Patrick, et al. 2010). The original PABS developed by Ostelo et al (2003) was developed first in Dutch but published with an English Language version simultaneously. Although not subject to a formal cross-cultural adaptation and validation process, a significant number of the original item pool were derived from measures which already existed in English. The English version of the PABS has since been used in several studies (Bowey-Morris et al. 2010; Rebbeck et al. 2013; Innes et al. 2015). There are no known studies investigating the measurement properties of the English language version in comparison with the Dutch version. Further cross-cultural adaptations using established forward-back translation

techniques (Beaton et al. 2000) have been undertaken to produce reliable and valid German (Laekeman et al. 2008), French (Simmonds et al. 2012), Brazilian-Portuguese (Magalhaes et al. 2011), Turkish (Dalkilinc et al. 2015), Japanese (Takasaki et al. 2014) and Norwegian (Eland 2013) versions from the English language version. A Swedish version also exists (Overmeer et al. 2009), although formal forward-back translation procedures are not reported and therefore the quality of this process cannot be assessed.

2.8.2.4 Responsiveness

Based on the findings of three studies (Vonk et al. 2009; Bowey-Morris et al. 2010; Overmeer et al. 2009), Mutsaers et al (2012) rated the responsiveness of the PABS as positive. In the COSMIN taxonomy responsiveness is defined as "the ability of an instrument to detect change over time in the construct to be measured" (Mokkink, Terwee, Patrick, et al. 2010). The criterion approach to measuring the responsiveness of an instrument is that the degree to which it changes should be matched by a change on a 'gold standard' measure (de Vet et al. 2011). Since there is no 'gold standard' comparator of the PABS, it is not possible to test the responsiveness of the PABS as defined by COSMIN. The three studies reported in Mutsaers et al (2011) are all intervention studies where the PABS has been used to detect a change in biomedical and biopsychosocial clinical orientation following a behavioural educational intervention. None of these studies were designed to test the responsiveness of the PABS as proposed by the COSMIN group i.e. no a priori hypotheses were formulated about the direction or magnitude of change scores and no comparator instrument were reported (Mokkink, Terwee, Patrick, et al. 2010). Thus

it is argued that the responsiveness of the PABS has not yet been established and may be difficult to test in the absence of a 'gold standard' criterion.

2.9 Concluding remarks

In this chapter the growing burden of, and the complexities associated with, persistent or recurrent complex MSK conditions were reported. The traditional biomedical approach fails to address the needs of these complex patients. In spite of this many HCPs continue to practise within a biomedical clinical approach. Although the biopsychosocial approach is broadly accepted, attempts to implement the approach within MSK clinical practice have been compromised by a number of influences. HCPs' attitudes and beliefs toward MSK pain are one recognised barrier to implementing the biopsychosocial approach. One of the limitations for developing further knowledge of the impact of HCPs attitudes and beliefs is the lack of a robust measure of HCPs' attitudes and beliefs towards MSK pain. The PABS was identified as the best of the available measures, however it suffers from a number of limitations. First, the biopsychosocial orientation scale is consistently weak across a number of measurement properties including internal consistency, test-retest reliability and construct validity. Second, the lack of conceptual clarity regarding the biopsychosocial treatment orientation potentially explains the poor performance of the biopsychosocial scale. Finally, the PABS was developed for physiotherapists in the context of LBP. A generic measure for all HCPs and all MSK conditions would allow meaningful comparisons of findings across different MSK disorders and different professions. Consequently, the aims of this thesis are to develop a new conceptual framework for the biopsychosocial clinical

orientation to common MSK pain and secondly to develop and test a new generic version of the PABS.

The next chapter will present a scoping review of the attitudinal constructs used to assess and quantify HCP's attitudes and beliefs about common MSK pain to date. This study will fulfil the first stage in the scale development process by identifying any existing measures or group of items which might serve in the development of the new biopsychosocial clinical orientation scale.

Chapter 3: The attitudinal constructs used to quantify HCPs' attitudes and beliefs: a systematic scoping review

Chapter 3: The attitudinal constructs used to quantify HCPs' attitudes and beliefs: a systematic scoping review

3.1 Chapter introduction

This chapter describes a systematically conducted scoping review of the attitudinal constructs used to assess and quantify HCP's attitudes and beliefs about common MSK pain to date. Of interest are the attitudinal constructs which have been reported in the literature, not just those which exist within a formal measurement tool, and the way in which these constructs have been operationalised as measurement items. This scoping review also seeks to determine which biopsychosocial constructs have previously been operationalised in the quantification of HCPs' attitudes and beliefs about common MSK pain. This scoping review is the first stage of the scale development process. Appendices 2 to 5 contain the supporting materials which are referenced within this chapter.

3.2 Aim and objectives of research stage one: review of existing literature and constructs

The aim of this scoping review was to identify constructs which have been used in published literature to measure HCPs' attitudes and beliefs about common MSK pain. To achieve this aim the following objectives were addressed:

1. Identify published studies in which HCPs' attitudes and beliefs about common MSK pain have been assessed and quantified
2. Determine the attitudinal constructs which have been operationalised in the quantification of HCPs' attitudes and beliefs, and which of these might correspond to a biopsychosocial clinical orientation
3. Examine the origin and development of the attitudinal items utilised in the included studies
4. Explore trends in the use of attitudinal constructs within the included studies

This scoping review differs from more typical systematic reviews, in that it concerns the constructs that have been operationalised to quantify HCPs' attitudes and beliefs in the included studies, rather than the findings of the studies. For example, rather than being interested in the *outcome* of a study investigating the relationship between HCPs' attitudes and beliefs about LBP and their recommendations for activity and work for patients, the focus of interest here is on which attitudinal constructs were utilised within the study. Furthermore, while the data for synthesis were generated from quantitative studies, constructs of attitude or belief are inherently 'thematic' or qualitative; for example, the belief that activity should be avoided if one is in pain. This chapter will therefore start with a brief examination of the systematic review methodology that informed the approach taken in this review.

3.3 Systematic review methods: traditional and alternative approaches

Systematic reviews have been described as a way in which what is known about a topic from the literature can be brought together using explicit and accountable methods (Gough et al. 2012). They are often contrasted favourably with non-systematic, narrative reviews where undefined methods of searching, critiquing and synthesising literature increase the risk of biased and inaccurate conclusions (Aveyard 2010). With their potential to distil findings from a rapidly expanding literature, systematic reviews have been at the forefront of both the evidence-based practice and knowledge translation movements over the last 20 years (Grant & Booth 2009; Grimshaw 2010).

The Cochrane Collaboration (Higgins & Green 2011), one of the bodies with whom systematic reviews have become synonymous, describe their key characteristics as including:

- a clearly stated set of objectives with pre-defined eligibility criteria for studies;
- an explicit, reproducible methodology;
- a systematic search that attempts to identify all studies that would meet the eligibility criteria;
- an assessment of the validity of the findings of the included studies, for example through the assessment of risk of bias; and
- a systematic presentation, and synthesis, of the characteristics and findings of the included studies

Systematic reviews have been particularly effective for addressing questions concerning the effectiveness of health and social care interventions (Jenkins et al. 2015; Kamper 2015). These reviews primarily employ statistical meta-analysis of data from experimental studies (Grant & Booth 2009). However, it is now widely accepted that this traditional meta-analytic approach is not suitable for all review questions, or for the synthesis of findings from a wider variety of study designs (Popay et al. 2006). The development of alternative knowledge synthesis and review methods has accelerated in recent years, in line with the increasing recognition of the value of qualitative and mixed methods research and greater demand for answers to questions other than those of treatment effectiveness. For example, understanding the relationship between the characteristics of clinical practice guidelines and their implementation by clinicians (Kastner et al. 2011), or why an intervention might work in some situations but not in others (Pawson et al. 2005).

As the logic of systematic methods for reviewing literature can be applied to all types of research, Gough et al (2012) suggest that there is the potential for as much variation in systematic review methodology as is found in primary research. However, it has also been observed that the rapid proliferation of review methods has led to a "bewildering plethora" of designs (Grant & Booth 2009, p92) and that a lack of clarity about the most appropriate method of synthesis for a given research question is potentially compounded by the similarity of many of the approaches (Barnett-Page & Thomas 2009; Sandelowski et al. 2012).

Despite attempts to characterise the growing number of systematic review methods (Dixon-Woods et al. 2005; Grant & Booth 2009) there is currently no consensus regarding the indication for any specific review method (Kastner et al. 2012). This has led several authors to stress the importance of focusing on the specific requirements of the review question when determining the appropriate methodological approach (Tricco et al. 2011; Grimshaw 2010). This call is echoed by those who also advocate greater focus on the philosophical underpinnings, or "defining logics" of the research synthesis and the (primary) research findings on which it is based (Sandelowski et al. 2012; Barnett-Page & Thomas 2009, p317).

As described earlier, a fundamental difference between this investigation and a conventional systematic review is that the data of interest were not the individual study findings, but rather the constructs that were operationalised within the studies in order to assess and quantify HCPs' attitudes and beliefs about MSK pain. This exploratory purpose,

described by Davis et al (2009) as reconnaissance, has much in common with a scoping review.

3.3.1 The scoping review method and framework

Scoping reviews are an increasingly popular method of knowledge synthesis, which incorporate a range of study designs to systematically summarise health research evidence (Levac et al. 2010; Colquhoun et al. 2014; Centre for Reviews and Dissemination 2009). Scoping reviews appear in both emerging and established areas of research, due to their facility to incorporate the diversity of methodologies in the former and to précis the volume of evidence in the latter (Colquhoun et al. 2014). A lack of consensus on the terminology, definition, methodology and reporting of scoping reviews has contributed to the method being considered to be emergent, or evolving (Davis et al. 2009). However, an established framework for the conduct of a scoping review has existed for more than a decade (Arksey & O'Malley 2005), and was enhanced by Levac and colleagues more recently (Levac et al. 2010). The following definition was recently recommended as a means of distinguishing scoping reviews from other forms of synthesis:

> *"A scoping review or scoping study is a form of knowledge synthesis that addresses an exploratory research question aimed at mapping key concepts, types of evidence, and gaps in research related to a defined area or field by systematically searching, selecting, and synthesising existing knowledge".*
>
> (Colquhoun et al. 2014, p1293-1294)

Although similar in many respects, there are differences between the established approach to scoping reviews and that associated with more conventional systematic reviews of intervention effectiveness. The main areas of comparison between the approaches are summarised in table 3.1. The primary features which make the scoping review the method of choice for this investigation are the ability to include all pertinent study methodologies in the review and that the inclusion of data is not contingent on assessment of study quality (Grabovschi et al. 2013). As this investigation was solely concerned with identifying attitudinal constructs that have been used to assess HCPs' attitudes and beliefs about MSK pain, rather than the results of included studies, it was not considered desirable to limit the inclusion of studies to certain designs.

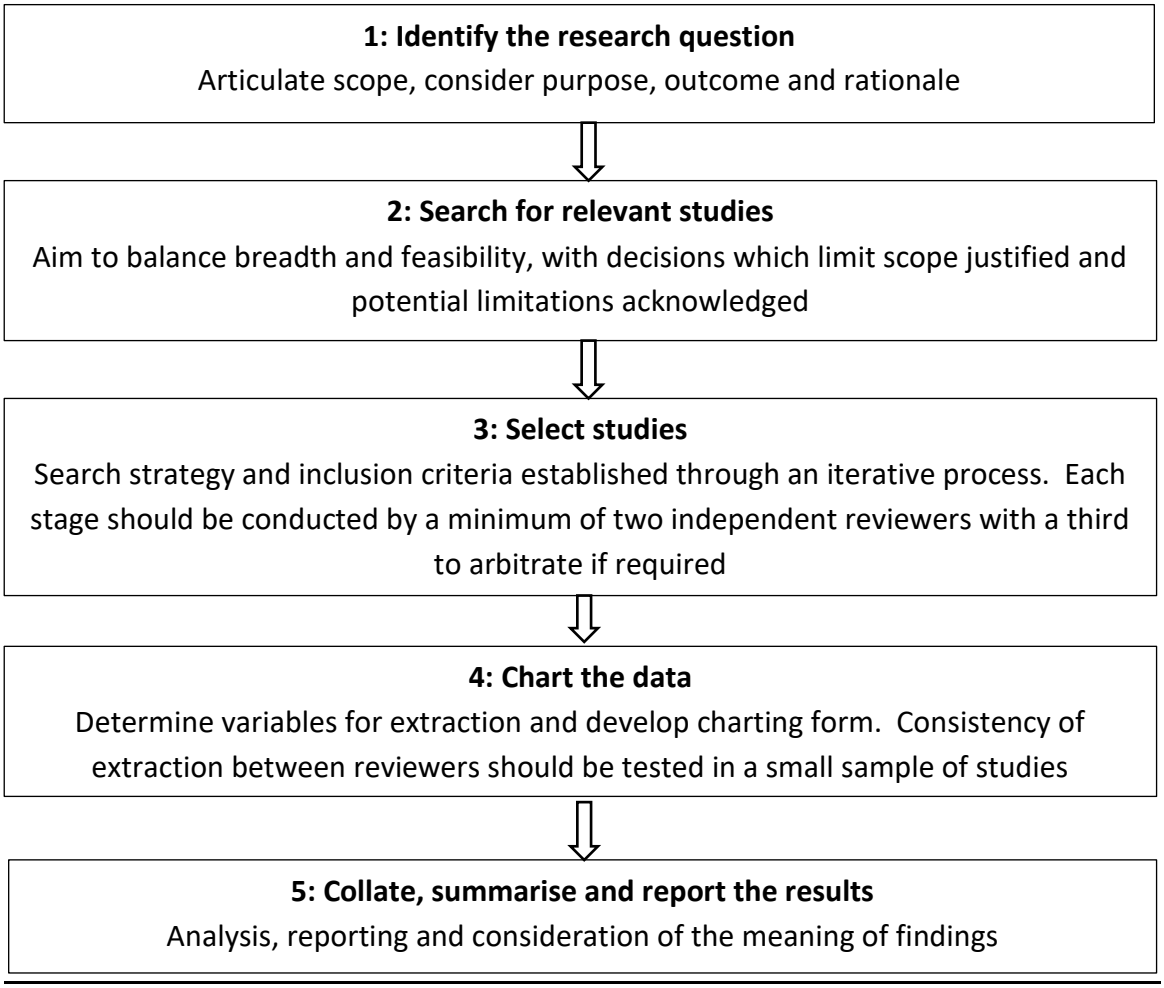
Table 3.1: Comparison of conventional and scoping review methods

Review of intervention effectiveness	Scoping review
• Focused research question with narrow parameters • Inclusion/exclusion usually defined at outset • Quality filters often applied • Detailed data extraction • Quantitative synthesis often performed • Formally assess the quality of studies and generates a conclusion to the focused research question	• Research question(s) often broad • Inclusion/exclusion can be developed post hoc • Quality of included studies is not an initial priority • May or may not involve data extraction • Synthesis more qualitative and typically not quantitative • Used to identify parameters and gaps in a body of literature

Sources: Armstrong et al. 2011; Arksey & O'Malley 2005; Davis et al. 2009

The stages of the scoping review framework are illustrated in figure 3.1. An optional consultation stage is described by both Arksey and O'Malley (2005) and Levac (2010) which provides the opportunity for stakeholder involvement in the review and validation of study findings. As this step was not indicated in this study, it is not included in figure 3.1. Given the suitability of the scoping review method to address the aims of this review, this

approach was chosen for this study and the methods employed are described in detail below.



Sources:(Arksey & O'Malley 2005; Levac et al. 2010)

Figure 3.1: Summary of the scoping literature review framework

3.4 Methods

This review was conducted and reported in accordance with the scoping review guidelines outlined above (section 3.3.1) and, as reporting guidelines are yet to be published for

scoping reviews, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used to ensure a robust methodology (Moher et al. 2009).

3.4.1 Identification of relevant studies

3.4.1.1 Search for relevant studies

Given the exploratory nature of this review, and the requirement for comprehensiveness and breadth in the search, the systematic search strategy was developed to be as sensitive as possible. The strategy aimed to identify published studies that had investigated the attitudes and/or beliefs of qualified HCPs towards common MSK pain, and it therefore consisted of three combined components summarised in box 3.1. Search terms for each of the components were drawn from known literature in the area of HCPs' attitudes and beliefs about pain and from the author's (KD) clinical experience and through discussion with supervisors. In each search engine, these were combined with Boolean operators, truncation and MeSH terms; an example of the full search strategy, as applied to the MEDLINE database is included in appendix 2. Prior to running the full search, the search strategy was pilot tested to ensure that it was sufficiently sensitive to capture all the studies of which the author (KD) had been previously aware.

The literature search was conducted in eight electronic databases: Medline, PsychInfo, AMED, EMBASE, the British Nursing Index, CINAHL, the Cochrane databases and the Web of Science. The search was limited to studies published in English between January 1977 and the end date (December 2011). The year 1977 was chosen as it was the year that George Engel's seminal call for a biopsychosocial medical model was published. It also pre-dated the earliest work in the area of HCPs' attitudes and beliefs to MSK pain known to the author (KD) at that time (Cherkin, MacCornack, & Berg, 1988) by more than 10 years. Given

the focus on published literature, 'grey' and unpublished literature was excluded from the search.

Healthcare practitioners	health care or medical professional, practitioner, provider or personnel general or primary care practitioner doctor, GP, medic(s), physician, consultant, rheumatologist, nurse, physiotherapist, chiropractor, osteopath, therapist, practitioner, clinician
AND	
Attitudes and beliefs	treatment, practice or therapeutic approach, orientation or style attitude, belief, judgment, perception, philosophy, prejudice, opinion, stance, view, viewpoint, fear avoidance, pain-related fear, pain catastrophizing
AND	
Musculoskeletal pain	Musculoskeletal, non-specific, non-malignant, chronic widespread or multi-site pain Back, lumbar, thoracic, neck, cervical, shoulder, glenohumeral, scapular, arm, hand, hip, knee, ankle, foot, joint, muscle pain NSLBP *Fibromyalgia*,* whiplash*
**Fibromyalgia and whiplash were initially included as search terms – however, on further discussion it was decided to exclude these studies, given that specific diagnostic criteria exist for fibromyalgia* (Wolfe et al. 2010) *and that whiplash is often associated with trauma and was therefore not considered to be common MSK pain (by the criteria used in this thesis and laid out in section 2.2).*	

Box 3.1: Search terms for each component used to identify studies

Once the selection of studies for inclusion in the review was finalised, the reference lists of all included studies were also examined in order to identify any previously unidentified studies that may have been relevant to the review. In addition, the reference lists of the three systematic reviews known to the author (KD) in this topic area (Cottrell, Roddy, & Foster 2010; Darlow et al. 2012; Fullen et al. 2008) were also checked for potentially relevant studies.

As this was the first study undertaken within this PhD programme of work, several years have passed since the initial search was undertaken and the completion of this thesis. In order to identify more recent studies, and establish if they might influence the interpretation and implications of the findings of this review, the search was re-run using the same strategy and databases for the dates January 2012 to June 2015. Although the additional studies identified were not subject to the same processes of data extraction and analysis, details of the results and implications of this update are included in section 3.5.6.

3.4.1.2 Inclusion and exclusion criteria

The inclusion and exclusion criteria that were applied at each stage of the review process are detailed in table 3.2. While many of these criteria were easily determined by the focus of the review on common MSK pain in adults, the interest in what and how researchers quantify HCPs' attitudes and beliefs required consideration of a number of issues. From the pilot search, review of titles and included abstracts, it was evident that there is a considerable body of published literature investigating HCPs' opinions about the diagnosis or their preferred management of a wide variety of MSK conditions. These studies commonly employ clinical vignettes to capture clinical opinion. The relationships between the attitudes and beliefs held by an individual, their behavioural intention and actual behaviour were discussed in chapter 2. In section 2.5, it was argued that while undoubtedly influential, personally held attitudes and beliefs are not the sole determinant of an individual's behaviour. It was therefore decided that it would be inappropriate to infer an attitude or belief from self-reported clinical behaviour only. Therefore, only studies which investigated and quantified constructs identified as HCPs' attitudes or beliefs were included. In addition, as this review concerns attitudes and beliefs about common MSK

pain in general, studies were excluded if they solely investigated HCPs' attitudes and beliefs about the indication for, or efficacy of, specific treatments or interventions for MSK pain. As the aim of this scoping review was to identify constructs used in the (quantitative) measurement of HCP's attitudes and beliefs, studies employing qualitative methods alone were excluded from the review.

In keeping with the iterative approach to study selection employed within a scoping review (Levac et al. 2010), these criteria were refined during a pilot abstract review exercise which is described in the section below.

Table 3.2: Inclusion and exclusion criteria used to select studies for review

Inclusion Criteria	Exclusion Criteria
• Peer reviewed publication • English language • Dating from no earlier than 1977 • Concern common MSK pain • Deal with an adult population • Employ quantitative methodology • Investigate and quantify qualified HCP's attitudes and beliefs (therefore studies of student/unqualified populations excluded)	• Paediatric studies • Cancer pain/palliative care studies • Acute post-operative pain studies • Pain associated with trauma (including whiplash) • Any non-MSK condition e.g. Cardiovascular pain, neurological conditions, migraine, irritable bowel syndrome/abdominal pain, obstetric/gynaecological pain, chronic pelvic pain of urogenital origin, • Dental pain – except where orofacial/temporomandibular joint pain considered from a MSK perspective • Specific rheumatological conditions e.g. rheumatoid arthritis, ankylosing spondylitis and fibromyalgia • Joint pain associated with sickle cell anaemia • Fatigue – unless associated with chronic widespread pain • Non-human studies • Studies which only report HCP attitudes/beliefs about an intervention rather than the condition itself • Qualitative methodology and narrative reviews

Notes: HCP = Healthcare practitioner, MSK = musculoskeletal

3.4.1.3 Study selection

Following the removal of duplicate citations from the search results, the titles of the remaining studies were reviewed by the author (KD) and those considered to have no relevance to the review were removed. The exclusion criteria were applied conservatively during this stage to avoid the elimination of potentially relevant titles.

The pilot abstract review was conducted in two stages, the first of which was conducted with a random sample of 200 of the retained abstracts and the second with a separate random sample of 100 abstracts. In both stages KD reviewed all the abstracts and two second reviewers (AB and NF) reviewed half of the sample each. A small number of amendments were made to the inclusion and exclusion criteria following comparison and discussion of the results after the first stage of the review. The consistency of the application of the criteria was then checked following the second stage using Kappa scores to assess the level of agreement between KD and the second reviewers. The overall score of K = 0.796 was accepted as indication of a good level of agreement (Altman 1991), suggesting consistency in the understanding and application of the inclusion and exclusion criteria. It was therefore agreed that KD would continue with the abstract review independently.

Following the review of abstracts, the full texts of all retained studies were obtained and reviewed by KD. A second review of one in five of the studies excluded at this stage was performed by either AB or NF. As there was 100% agreement between the first and second reviewer on the exclusion of this sample of studies, those retained by KD were taken forward to the next stage of the review. However, 29 studies (none of which were included in the one in five sample for checking) for which eligibility for inclusion was more difficult

to determine were discussed and agreed by all three members of the investigative team (KD, AB and NF). Issues that complicated the application of the inclusion and exclusion criteria included: being unable to isolate the quantification of attitudes towards MSK pain from associated, or more general attitudes; or that HCPs' attitudes and beliefs were not directly quantified, but were used in a different way, such as the evaluation of congruence with another group's attitudes.

3.4.2 Data extraction and charting

Two independent reviewers extracted data from the included studies; with KD reviewing all the studies and AB and NF reviewing half of the included studies each. The data were extracted using a standardised data-charting form (see appendix 3) which included: Study author(s), study characteristics, the authors' intended target HCPs' attitude(s) (if stated), all individual attitudinal items utilised in the study and any details provided about the origin and development of these items.

Although many, but not all, of the included studies provided some indication of their target attitude, for example HCPs' "back pain beliefs" (Werner et al. 2008) or "treatment orientation" (Houben et al. 2005; Ostelo et al. 2003), these were often poorly defined or very broad. Therefore, they did not provide a useful unit for comparison and synthesis across all the included studies. It was therefore decided that the individual attitudinal items utilised in each study would serve as the source data for this investigation. Items were only extracted if they were identified by the author(s) of the paper as being attitudinal. They were not extracted if they were described as assessing something other than attitude (e.g.

knowledge), even if they appeared to be attitudinal, or had been used as an attitudinal item in another study.

3.4.3 Data synthesis and summary

While extraction of individual measurement items provided comparable data from all studies, and there was a degree of conceptual commonality among many of the items, they were too numerous and varied to serve as a practical unit of synthesis. In the context of a reflective measurement model, the construct of interest is manifest in the chosen 'effect indicators', or measurement items. As a target construct was not always stated, or was sometimes poorly defined, a thematic analytic approach was adopted to determine the attitudinal construct, or theme, represented by each of the items extracted.

Each member of the investigative team (KD, AB and NF) independently identified the attitudinal theme they considered to be reflected by each of the items extracted. For example, item 2 from the HC-PAIRS (Rainville et al. 1995) – "*An increase in pain is an indicator that a chronic back pain patient should stop what he is doing until the pain decreases"* might be interpreted as representing the relationship between pain and activity and, furthermore, that the relationship is limiting and that painful activity should be avoided. The two reviewers for each study then met for the first of two consensus processes, during which the extracted items and the reflected attitudinal theme were agreed. Where agreement could not be met, the third reviewer was consulted to reach consensus.

In the second consensus process all three reviewers met to collate the identified themes into an overall schema of the attitudinal constructs represented by the extracted items. To

facilitate the synthesis of the many conceptually similar, but not identical attitudinal themes identified into distinct constructs, this iterative process resulted in the utilisation of both first- and second-order constructs. Broad or overarching themes became second-order constructs, which could contain a number of associated first-order constructs. Therefore, items identified as representing related, but conceptually or contextually distinct (first-order) constructs, such as the 'importance of diagnosis to appropriate treatment' and the 'value of X-ray/imaging/diagnostic tests' could be united in a second-order construct, in this case 'the ability to reach/necessity for a diagnosis.' Figure 3.2 summarises the data extraction and syntheses stages.

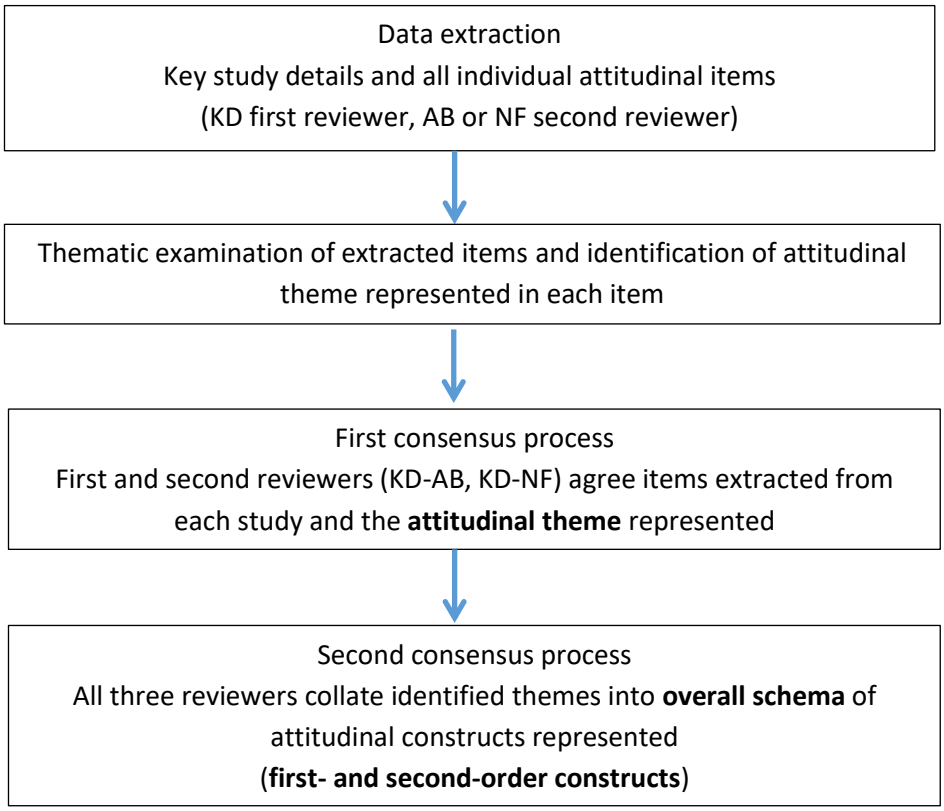


Figure 3.2: Summary of the data extraction and synthesis process

As described in section 3.3.1 (see table 3.1), the synthesis of findings within scoping reviews is usually qualitative (Armstrong et al. 2011). Narrative synthesis approaches permit identification of the range, frequency and chronology of common themes and constructs which have been used to quantify HCPs' attitudes and beliefs (Popay et al. 2006). Narrative summaries, tables and figures are therefore used in the results section below to describe the outcome of study selection, the characteristics of the included studies, and the attitudinal constructs identified.

3.5 Results

A total of 14250 studies were identified in the electronic database search. Following the successive rounds of review, 48 studies were retained for inclusion in the scoping review. In concordance with the PRISMA statement (Moher et al. 2009), the outcome of each round is summarised in the flow diagram in figure 3.3.

3.5.1 Characteristics of the included studies

The earliest study included in the review was published in 1984 (Lorig et al. 1984) and the most recent in 2012 (Slater et al. 2012). The study by Slater et al (2012) was initially identified from a published conference abstract (Slater et al. 2010) captured in the initial search (conducted in December 2011), however a full-text article was available early in 2012, it met the inclusion criteria and was therefore included.

The included studies investigated attitudes and beliefs of a wide range of HCP groups, across a number of different countries and practice settings. As anticipated, the included studies were also methodologically heterogeneous with two reporting randomised

controlled trials, 11 quasi-experimental prospective studies involving information dissemination or educational interventions, two prospective observational cohort studies and 33 cross-sectional surveys. Eight of the 33 survey studies were concerned, either wholly or in part, with the development or psychometric testing of a measure of HCPs' attitudes and beliefs. The characteristics of all included studies are summarised in appendix 4.

3.5.2 Extracted attitudinal items

To ensure that the representation of the attitudinal constructs reflected in the extracted items could be established accurately, every item used in each study was individually extracted. This led to the identification of 665 individual attitudinal items from the 48 included studies. There was unanimous agreement between the members of the investigative team (KD, AB and NF) in terms of the identification of individual items across all the included studies. However, of the 665 items only 197 were unique as a considerable number of the same items were included across multiple studies. The list of unique items is provided in appendix 5. The majority of these items employed a Likert-style agreement scale, although other response formats included multiple-choice or 'tick all that apply' options. All the items extracted were used to generate quantitative data and had been identified by the original study authors as being attitudinal.

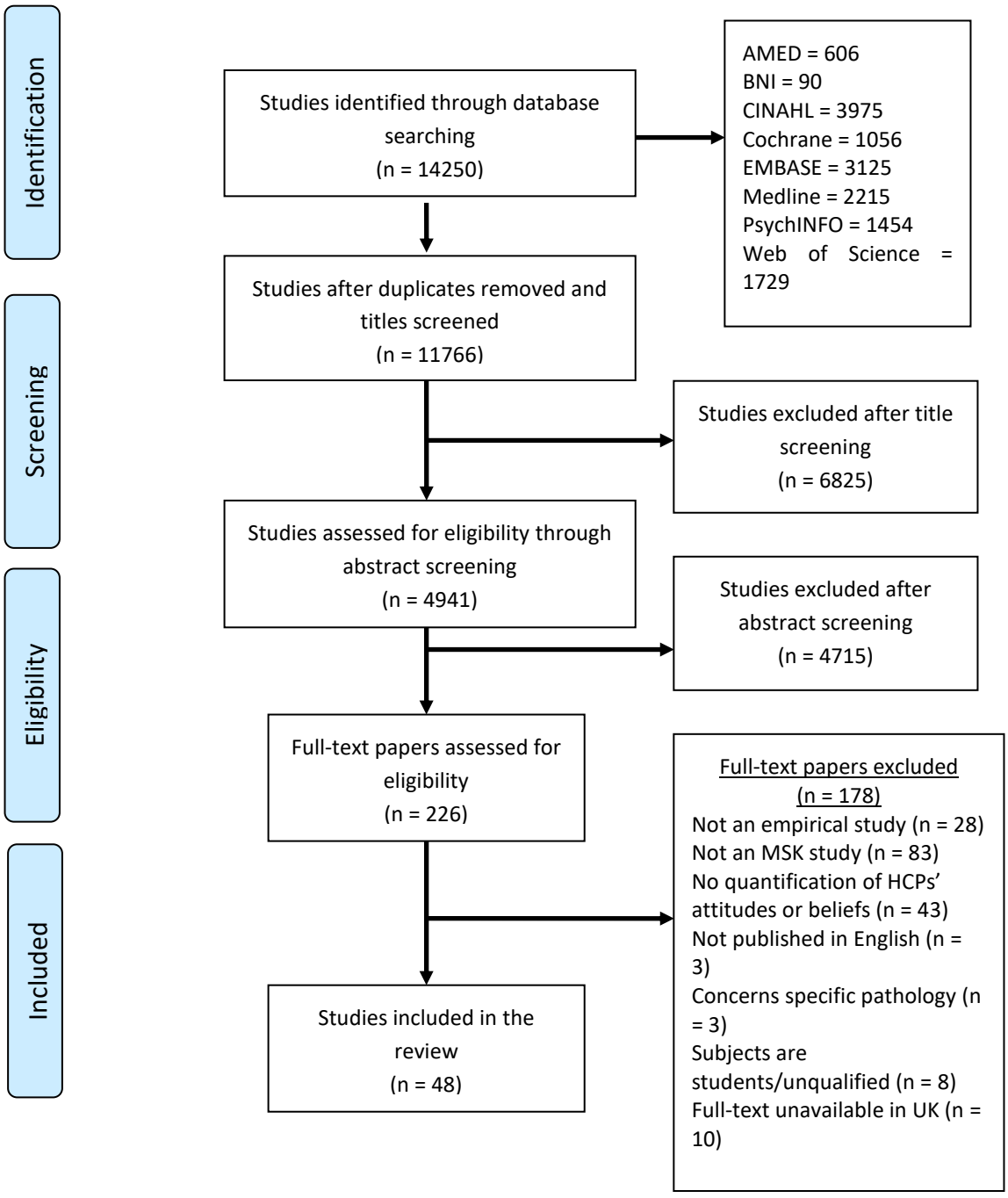


Figure 3.3: Flowchart of the review process

3.5.3 Origin of attitudinal items

The vast majority of the items which featured across multiple studies were extracted from one of the formal measurement tools identified in section 2.7. The remaining items were

incorporated into one or more non-standard survey instruments which had been developed or used in an earlier study. In some instances, the use of these existing items was acknowledged, but frequently the origin of items included in a survey instrument was not explained by authors. The available details concerning the origin and development of each unique item are provided in the table in appendix 5.

3.5.4 Identification of the attitudinal constructs represented in the extracted items

Thematic examination of the extracted items and consensus processes described in section 3.4.3 resulted in the identification of 44 first-order and 15 second-order attitudinal constructs. Four of the second-order constructs were undivided and without first-order constructs, thus providing 48 discrete constructs. Table 3.3 shows how these 48 discrete constructs were organised under the 15 second-order constructs.

Included in table 3.3 are the number and proportion of items (number of items representing the construct/total number of items) representative of each second-order construct in both the unique and total item pools; and the number of studies in which each construct appears. The constructs are listed in order of the frequency with which they were represented in the total item pool. Although 15 second-order constructs were identified in total, a small number of constructs featured more frequently in the published literature than others. The five most common constructs each appeared more than 60 times in the total item pool. These were: 'the pain-normal physical activity relationship' (n=107); 'treatment' (n=101); 'work' (n=67); 'attribution/causality' (n=63) and 'the pain-harm relationship' (n=62) (see table 3.3). Together, these five constructs were represented by over 60% of the total item pool although they accounted for just one third of the second-

order attitudinal constructs identified. It is worth noting that although studies investigating HCPs' attitudes and beliefs about specific treatments for MSK pain were excluded from this scoping review, a significant number of the extracted items were judged by the reviewers to be representative of HCPs' attitudes and beliefs concerning treatment more generally. These items were assigned to the construct 'treatment (including focus/aim of treatment)', which was the second most common attitudinal construct identified in the included studies.

However, while the dominance of a small number of second-order constructs was noticeable, it was mirrored by an even greater concentration of items representing a very small number of discrete constructs. Over half (n=363) of the total items extracted were represented by just nine of the 48 discrete constructs. These nine discrete constructs (eight first-order and one second-order) are highlighted (in yellow) in table 3.3.

Table 3.3: Second-order and first-order attitudinal constructs and frequency of representation of attitudinal items

Second-order construct	Total items No. (%)	Unique items No. (%)	No. of studies	First-order constructs
The pain – normal (physical) activity relationship	**107 (16.1)**	**17 (8.6)**	**24**	Beneficial (positive/not harmful)
				Harmful (negative - should be limited/avoided)
Treatment (including focus/aim of treatment)	**101 (15.2)**	**29 (14.7)**	**25**	Belief in the availability/efficacy of a specific treatment (type) - including 'alternative'
				Belief in/use of placebo effect
				Limitation of treatment (no 'real' treatment)
				Focus = pain reduction
				Treatment is/is not pain contingent
				Focus = (restoration of) function
Work	**67 (10.1)**	**42 (21.3)**	**11**	Work - symptoms (effect of work on symptoms and, usually, symptoms on *ability* to work)
				Work - individual (essentially, effect of attributes of individual and ability/likelihood/inclination to work
				Role of clinician/clinical intervention
				Role of employer
				Communication
				Importance of early RTW
Attribution/causality	**63 (9.5)**	**14 (7.1)**	**26**	Existence of an 'exact cause'
				Structural/physical cause (absence or presence)
				Psychosocial (incl. stress)
				Unknown
				'Seriousness' of disease
The pain - harm/damage relationship	**62 (9.3)**	**9 (4.6)**	**14**	*Discrete second-order construct, no first-order*
Expectations	54 (8.1)	8 (4.1)	22	Outcome expectancy (especially work)
				… of patients about what clinicians can do (for them)
				…and link to (patient) satisfaction
				… of patients and influence on clinical behaviour
				…of clinicians
				… of others
				… of patients for/of investigation and treatment)

Clinician confidence and comfort (with managing common MSK pain)	41 (6.2)	17 (8.6)	17	Emotional response **(positive or negative)**
				Perceived knowledge/skills/'tools'
				Clinician perception of their patients' satisfaction
				Confidence/preparedness and/or "comfort"
Prognosis/ natural history of condition	33 (5.0)	14 (7.1)	16	Self-limiting/spontaneous recovery/positive
				Likelihood of chronicity/negative
				Future risk/vulnerability
Impact of condition	33 (5.0)	6 (3.0)	10	(Dis)ability/function
				Quality of life
Determinants of outcome	32 (4.8)	6 (3.0)	21	Psychosocial factors - including patient motivation, patient beliefs, learning to cope with stress
				Understanding/explanation
				(Return to) normal activity/work
Role of clinician or (desirable) clinical actions/behaviours	22 (3.3)	13 (6.6)	7	Provision of information/reassurance
				Secondary prevention/prevention of chronicity
				Exploring/supporting patients' psychological difficulties
Prescribed exercise and rest (therapeutic use of/as treatment)	21 (3.2)	6 (3.0)	16	*Discrete second-order construct, no first-order*
Ability to/necessity for (precise) diagnosis	10 (1.5)	6 (3.0)	8	Importance of diagnosis to appropriate treatment
				Value of X-ray/imaging/diagnostic tests
Clinicians' perceptions of what patients think (various topics)	10 (1.5)	7 (3.6)	3	*Discrete second-order construct, no first-order*
Perceived value and use of condition specific guidelines/clinical tools	9 (1.4%)	2 (1.0)	5	*Discrete second-order construct, no first-order*

Notes: Italics = the primary constructs which were discrete i.e. no sub-division /secondary constructs; Yellow highlights indicate the nine discrete constructs (eight first-order and one second-order) which explain more than half of the total items; RTW=return to work

Of the 363 items assigned to these nine discrete themes, 66 were unique. Examination of the origin of these 66 unique items (which are highlighted in the complete table of unique items in appendix 5) showed that the majority (n=51) were extracted from one of the small number of formal measures of HCPs' attitudes and beliefs.

3.5.5 Unallocated items

There were a number of items for which the two reviewers were unable to identify a clear, discrete underlying attitudinal construct. These were discussed with the third reviewer and, where possible, an underlying construct was agreed by consensus. However, there were 14 items for which it was not possible to identify a single, clear attitudinal construct and for which consensus was reached to exclude them from the synthesis. Reasons for this included: the item contained more than one concept or was highly specific to a particular setting or context (e.g. the ABS-mp contains a sub-scale of four items concerning a clinicians' perceptions of their connection to the healthcare system (such as "I am concerned about the quality of treatment my referred patients receive"), which was judged to be more indicative of attitudes about the prevailing health service than MSK pain) and therefore these items were excluded from the synthesis. There were also a small number of items which used obscure, outdated or potentially controversial language (e.g. 'handicapped') which made an accurate assessment of the underlying attitudinal construct impossible. The 14 unallocated items are included in the table of items in appendix 5.

3.5.6 Effect of formal measures on the trends in the use of attitudinal constructs

3.5.6.1 Representation of second-order constructs within formal measurement tools

For the purpose of this investigation, 'formal' measurement tools were defined as identified scales which were utilised in two or more of the included studies. These were:

the Back Beliefs Questionnaire (BBQ-HC; which was used in 3 studies), the Tampa Scale of Kinesiophobia (TSK-HC; 2 studies), the Attitudes to Back Pain Scale in Musculoskeletal Practitioners (ABS-mp; 3 studies), the Fear Avoidance Beliefs Questionnaire (FABQ, 4 studies), the Health Care Professionals Pain and Impairment Relationship Scale (HC-PAIRS, 13 and 15 item versions; 3 and 6 studies respectively) and the Pain Attitudes and Beliefs Scale (PABS, with quantitative data reported from 17, 19 and 20 item versions; in 4, 5 and 2 studies respectively). The constructs represented by the items in each of these tools are illustrated in figure 3.4. The 19-item version of the PABS contains the greatest number of different attitudinal constructs, with seven of the 15 second-order constructs represented. The PABS was created using items from the original (patient) versions of the TSK, the BBQ and the FABQ. It is therefore unsurprising that five of the seven constructs represented also appear in one or all of the adapted versions of these tools. The HC-PAIRS and FABQ each contain just three constructs, with 'expectations' featuring in both these tools but no other. The ABS-mp includes two constructs that do not feature in any other formal measure: 'Clinician confidence and comfort (with managing common MSK pain)' and 'role of clinician or (desirable) clinical actions/behaviours'. The construct of 'the pain-normal physical activity relationship', identified above as the most prevalent second-order construct in the total item pool, featured in every tool. It is evident therefore that the formal measures identified in this review operationalise a narrower range of conceptual constructs than were identified across the published literature as a whole.

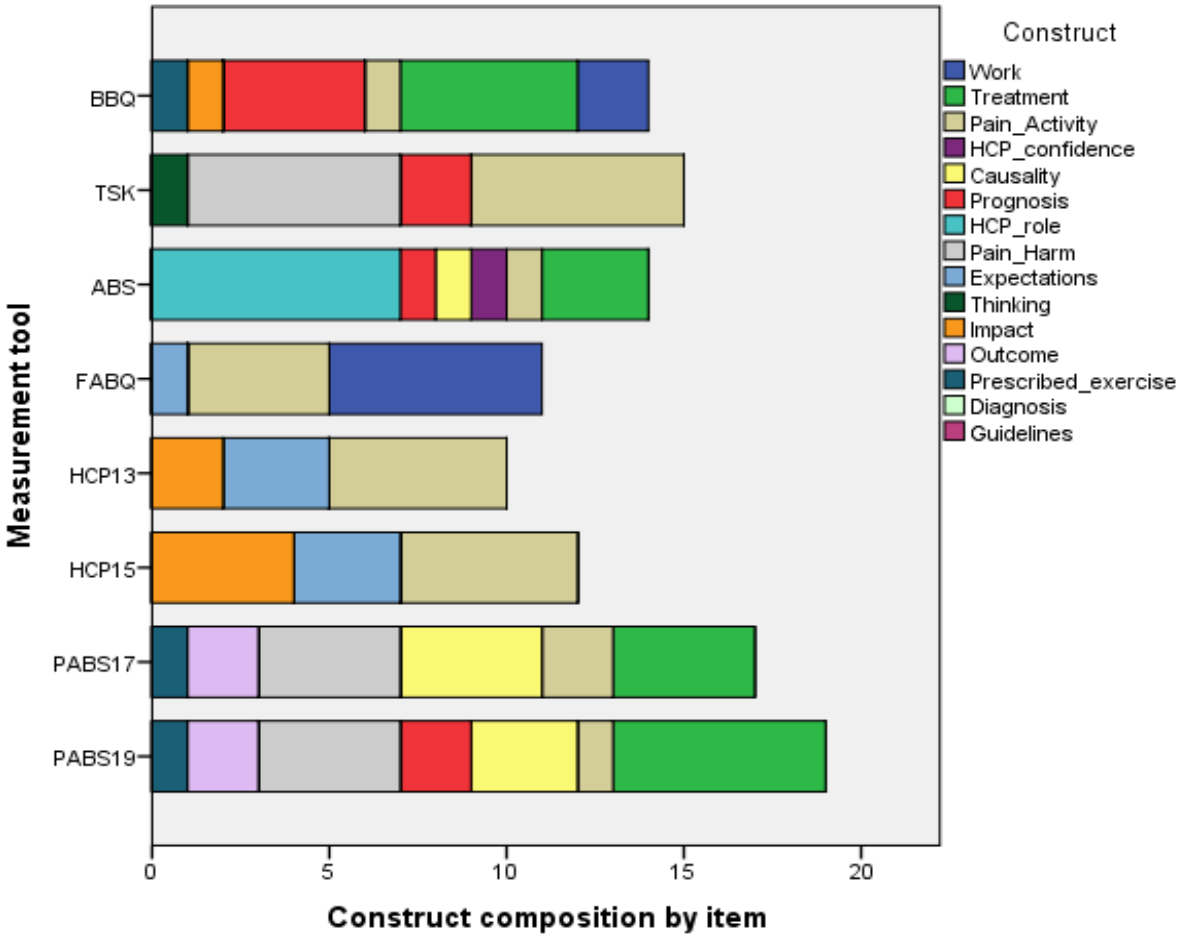


Figure 3.4: Construct composition of formal measurement tools

BBQ=Back Beliefs Questionnaire; TSK=Tampa Scale for Kinesiophobia; ABS=Attitudes to Back Pain Scale for musculoskeletal practitioner; FABQ=Fear Avoidance Beliefs Questionnaire; HCP13=13 item version of Health Care Providers' Pain and Impairment Relationship Scale; HCP13=13 item version of the Health Care Providers' Pain and Impairment Relationship Scale; HCP15=15 item version of the Health Care Providers' Pain and Impairment Relationship Scale; PABS17= 17 item Pain Attitudes and Beliefs Scale; PABS19=19 item Pain Attitude and Beliefs Scale; Pain_Activity= The pain-normal (physical) activity relationship; HCP_confidence=Clinician confidence and comfort; Causality=Attribution/causality; Prognosis=Prognosis/ natural history of condition; HCP_role=Role of clinician or (desirable) clinical actions/ behaviours; Pain_harm=The pain-harm/damage relationship; Thinking=Clinicians' perceptions of what patients think; Impact=Impact of condition; Outcome=Determinants of outcome; Prescribed_exercise=Prescribed exercise and rest; Diagnosis=Ability to/necessity for (precise) diagnosis; Guidelines=Perceived value and use of condition specific guidelines/clinical tools.

The first formal measure of HCP's attitudes and beliefs towards MSK pain, the HC-PAIRS, was published in 1995. However, since this time it has become the norm, rather than the exception, for quantitative studies of HCPs' attitudes and beliefs about MSK pain to employ a formal measurement tool. Figure 3.5 illustrates the frequency of use of each of the formal measurement tools in addition to the trend in the number of studies over time. An increased rate of publication can be observed from 2004 onward, mirrored by the increased utilisation of formal measures of HCPs' attitudes and beliefs about MSK pain. Only eight of the 28 (29%) publications after 2004 do not include one of the formal measurement tools, in comparison to 16 of the 20 (80%) studies published up to and including 2004.

By 2012, the year that the latest study included in this review was published, the PABS and the HC-PAIRS had clearly become the most frequently used formal measurement tools to assess HCPs' attitudes and beliefs about MSK pain, appearing 11 and nine times respectively in the included studies. The increasing use of a small number of standardised tools over time has had the effect of increasing the representation of, and focus on, a small number of specific attitudinal constructs in the literature over time.

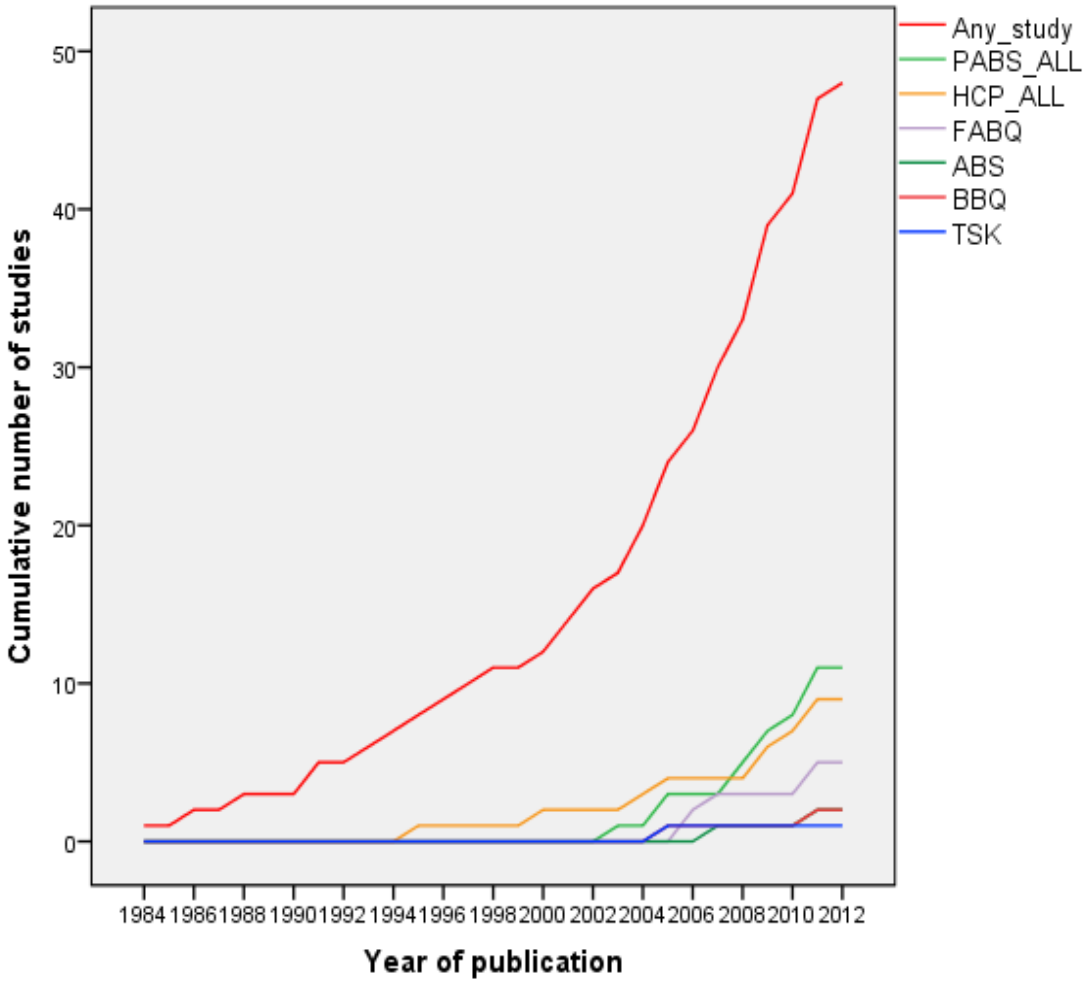


Figure 3.5: Cumulative use of formal measurement tools over time

PABS_ALL=all versions of the Pain Attitude and Beliefs Scale; HCP_ALL=All versions of the Health Care Providers' Pain and Impairment Relationship Scale; FABQ=Fear Avoidance Beliefs Questionnaire; ABS=Attitudes to Back Pain Scale for musculoskeletal practitioner; BBQ=Back Beliefs Questionnaire; TSK=Tampa Scale for Kinesiophobia

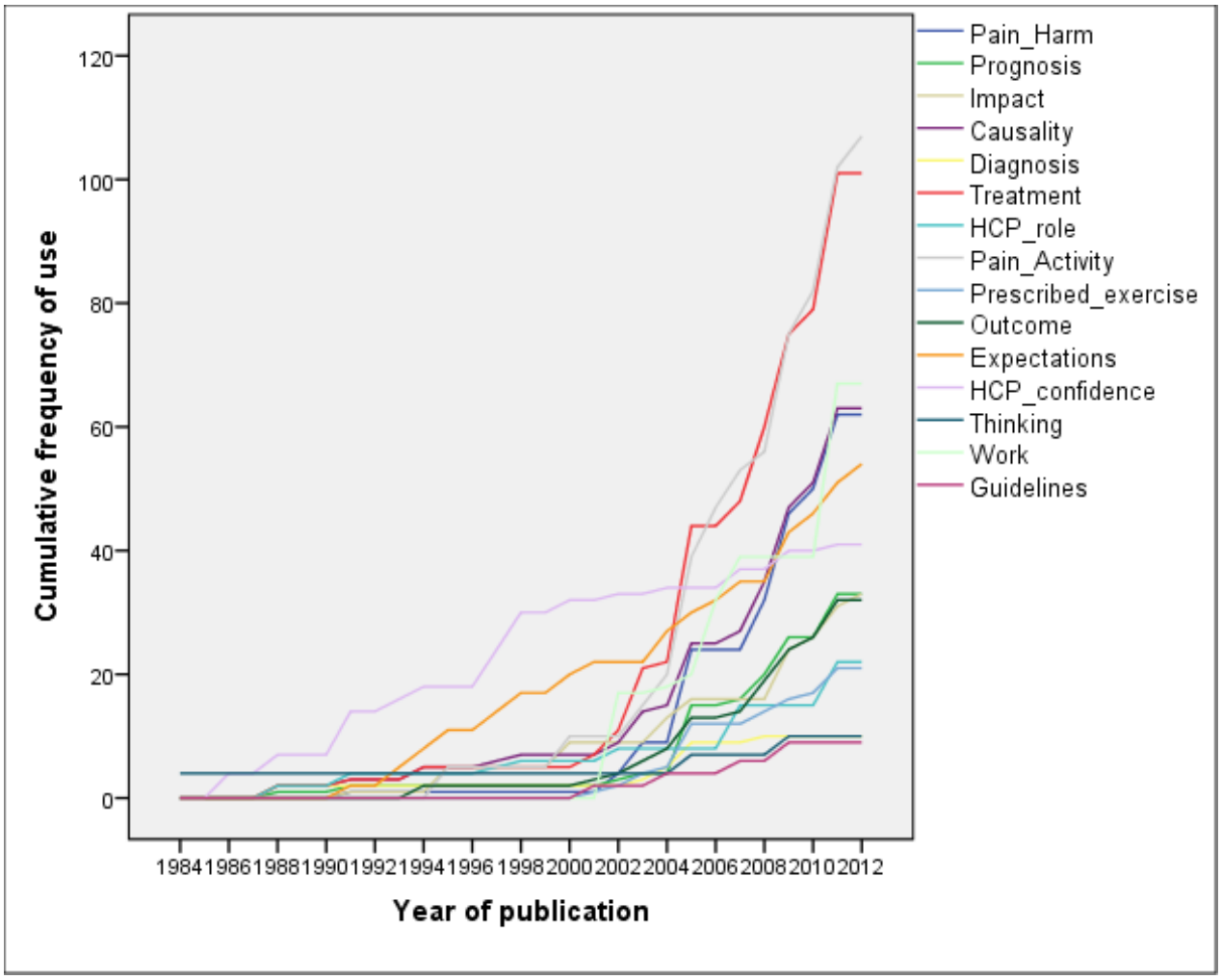


Figure 3.6: Frequency with which each construct appears in the literature over time
Pain_Activity= The pain-normal (physical) activity relationship; HCP_confidence=Clinician confidence and comfort; Causality=Attribution/causality; Prognosis=Prognosis/ natural history of condition; HCP_role=Role of clinician or (desirable) clinical actions/ behaviours; Pain_harm=The pain-harm/damage relationship; Thinking=Clinicians' perceptions of what patients think; Impact=Impact of condition; Outcome= Determinants of outcome; Prescribed_exercise=Prescribed exercise and rest; Diagnosis=Ability to/necessity for (precise) diagnosis; Guidelines=Perceived value and use of condition specific guidelines/clinical tools.

3.5.6.2 Representation of the second-order constructs over time

The frequency with which each second-order construct appears in the included studies over time is illustrated in Figure 3.6. This figure demonstrates the rapid increase in the use of the constructs of 'the pain-'normal' physical activity relationship', 'treatment', 'work',

'attribution/causality' and 'the pain-harm/damage relationship' after 2004. 'Expectations', which is strongly represented in the HC-PAIRS, also features prominently. However, it has appeared more consistently in the included studies over time than the ultimately more frequently used constructs, which were far less prominent in earlier studies. For example, 'the pain-harm/damage relationship' is represented by just a single item prior to 2002 and 'the pain-'normal' (physical) activity relationship' does not feature in any study before 1995.

Conversely, a number of constructs which were included in early attempts to quantify HCPs' attitudes and beliefs, but which do not feature in the more frequently utilised measurement tools, have become far less prevalent over time. For example, the construct identified as 'clinician confidence and comfort (with managing common MSK pain)' in this review is represented by a collection of items that are repeatedly used in a series of early studies conducted in the USA (Cherkin et al. 1988; Cherkin et al. 1991; Bush et al. 1993; Battié et al. 1994; Curtis et al. 1997) and later by Li and Bombardier (Li & Bombardier 2001) and Buchbinder and colleagues (Buchbinder et al. 2001b; Buchbinder & Jolley 2007; Buchbinder et al. 2009). However, having been among the most prominent constructs in these earlier studies, the construct has been rarely used in studies of HCPs' attitudes and beliefs after the late 1990s.

3.6 Discussion

The aim of this scoping review was to identify constructs which have been used in published literature to measure HCPs' attitudes and beliefs about common MSK pain. The search identified 48 studies in which these HCPs' attitudes and beliefs were assessed and quantified and led to the identification of 665 attitudinal items, of which 197 were unique.

Thematic examination of the unique items led to the identification of 15 second-order attitudinal constructs. The results of this review reveal a clear pattern in the use of different attitudinal constructs in the study of HCPs' attitudes and beliefs about MSK pain over time. In this final section of this chapter, these findings and their implications are discussed and the strengths and limitations of this scoping review examined.

3.6.1 Key findings

This review has demonstrated that the different attitudinal constructs used to quantify HCPs' attitudes have been subject to widely varying degrees of utilisation and therefore investigation. Two general patterns of use are discernible: Constructs which are both well represented and widely used and constructs which are poorly represented and infrequently used. These will be discussed in turn, followed by consideration of the two factors which potentially underpin this disparity in construct representation.

3.6.1.1 Over-represented constructs

The findings of this study demonstrate that the operationalisation of HCPs' attitudes and beliefs has become dominated by a small number of conceptually similar constructs. Of the five most prevalent attitudinal constructs highlighted in table 3.3, three appear in at least half the studies: 'the pain-'normal' physical activity relationship', 'treatment (including focus/aim of treatment), and 'attribution/causality'. The construct of work is represented by a large number of unique items which provides a misleading impression of the representation of this construct in the included studies. A large proportion (15/42) of the items representing 'work' were extracted from a single study (Guzman et al. 2002). However, items concerning work were only included in 11 of the 48 studies. In contrast, the fifth most prevalent construct, 'the pain-harm/damage relationship', was represented

by just nine (4.6%) of the unique items, but its representation doubled in the total item pool. The prevalence of this construct is even more marked as it is one of the nine singular constructs which together accounted for more than half of all extracted items. These nine singular constructs are highlighted yellow in table 3.3.

The majority of items representing these dominant constructs are framed in such a way that agreement endorses biomedical, or structural-pathological beliefs about common MSK pain and its management. For example, "back pain indicates the presence of organic injury" (PABS item originally derived from the TSK) or "an increase in pain is an indicator that a chronic back pain patient should stop what he is doing until the pain decreases" (from the HC-PAIRS). The conceptual similarity of so many of the most frequently used items is not surprising given the origin of many of them in measures designed to evaluate structural-pathological and fear avoidance beliefs in patients. However collectively they offer a very narrow range of the attitudinal constructs of potential relevance in MSK clinical practice. Their limitation is compounded by the fact that the valence of many of these items is such that agreement is consistent with structural-pathological or fear avoidant beliefs. Although disagreement with these items suggests a rejection of these biomedical statements, it does not provide any information about alternative beliefs. HCPs' attitudes and beliefs are therefore, for the most part, expressed in terms of their endorsement, or otherwise of the biomedical model.

However, these constructs have not been without utility in the study of HCPs' attitudes and beliefs. As discussed in section 2.5.3, measures in which they are well-represented (the HCPAIRS, PABS and adapted versions of the TSK, FABQ and BBQ) have demonstrated

moderate correlations between their scores and (self-reported) clinical behaviour (Houben et al. 2004; Bishop et al. 2008; Darlow et al. 2012). However, results to date are far from compelling, with one potential limitation being the limited range of pertinent clinical attitudes and beliefs captured by existing measures. In most circumstances the determinants of clinical behaviour are complex (Presseau et al. 2014), therefore a more comprehensive approach to the measurement of antecedent attitudes and beliefs is required in order to better understand the influence of attitudes and beliefs on HCPs' clinical behaviour.

3.6.1.2 Under-represented constructs

Among the 15 second-order attitudinal constructs identified in this review, one third were utilised infrequently in the included studies, and have therefore been subject to less investigation (see table 3.3). Four constructs; 'role of clinician or (desirable) clinical actions/behaviours', 'ability to/necessity for (precise) diagnosis', 'clinicians' perceptions of what patients think' and 'perceived value and use of condition specific guidelines/clinical tools', are captured in only a few of the included studies and represented by a small proportion of the extracted items. The construct of 'clinician confidence and comfort with managing common MSK pain' was prominent in early studies but has reduced over time.

Of these five under represented constructs, two are not included in any of the formal measurement tools and the other three feature in only a single measure. Two of these - 'role of clinician or (desirable) clinical actions/behaviours and 'clinician confidence and comfort (with managing common MSK pain)' - are included in the ABS.mp, the development of which was informed by previous qualitative interviews with MSK HCPs

(Pincus, Vogel, Santos, et al. 2006; Pincus, Vogel, Breen, et al. 2006). The relevance of this will be discussed further in section 3.6.1.3 below.

The common theme linking these under-represented constructs is that they are primarily clinician-oriented. The less frequent use of these constructs is at odds with qualitative studies of HCPs' attitudes and beliefs which identify attitudes far more in keeping with these under-utilised constructs such as frustration, confidence and tension within the therapeutic relationship (Daykin & Richardson 2004: Jeffrey & Foster 2012: Barlow & Stephens 2014; Synnott et al. 2015); and the resurgent interest in non-specific effects in the management of MSK pain such as therapeutic relationship (Testa & Rossettini 2016). The under-representation of these constructs in this body of work is concerning for a number of reasons. Firstly, as a consequence far less is known about these constructs of HCP attitude, although they are important in other MSK pain literature with evidence that these clinician-related factors are influential in patient satisfaction and outcome (Fuentes et al. 2014; Ferreira et al. 2013). Secondly, affective responses are an inherent component of attitude (Ajzen 2005), which is currently under-represented and therefore under-investigated in the quantitative study of HCP's attitudes and beliefs about MSK pain.

In addition to the under-representation of clinician-oriented constructs, there was a paucity of items representing recognised factors in the biopsychosocial approach such as social factors and discrete psychological constructs; which if featured were characterised collectively as 'mental stress and psychosocial factors' in items representing attitudes and beliefs about the cause of MSK pain (see table 3.3). The inclusion of items concerning work but very few concerning wider social influences mirrors the relative representation of these

constructs in the wider MSK literature; where the lack of attention afforded to wider social factors within the biopsychosocial approach has recently been highlighted (Pincus et al. 2013; Shaw et al. 2013). The under-representation of biopsychosocial constructs in measures of HCPs' attitudes and beliefs is in contrast to the emphasis they have received in the LBP and increasingly all MSK literature and clinical practice guidelines (Hill & Fritz 2011; Pincus & McCracken 2013; Koes et al. 2010; Goertz et al. 2013). A more comprehensive measure of HCPs' attitudes and beliefs is therefore urgently required.

3.6.1.3 Key methodological factors underpinning the disparity in construct representation

The disparity in representation of the identified attitudinal constructs in included studies appears to have been driven by two key factors; firstly, the increasing use of a small number of conceptually narrow measures and secondly, the difference between the attitudinal constructs derived from patient measures and those developed with some clinician involvement.

Dominant constructs driven by increasing use of conceptually narrow measures

It is understandable and in many respects desirable that once established and validated tools are available they are employed in studies within the field. Replicable and uniform measures allow clearer comparison between studies, and with repeated use the validity and reliability of the measures can be more accurately assessed (de Vet et al. 2011). Since 2007, 12 of the 18 studies included in this review employed either the PABS or the HC-PAIRS, which may be due, in part, to the identification of these two measures as the most widely validated and robust measures of HCPs' attitudes and beliefs currently available (Bishop et al. 2007). However, in this instance, an unintended consequence of the

increased utilisation of these tools has been to reduce the range of concepts used in the measurement of HCPs' attitudes and beliefs about MSK pain.

This conceptual narrowing is due to the inclusion of only a small number of attitudinal constructs in the established measures (see figure 3.4). Even the most conceptually 'expansive' tool, the PABS-19, contains less than half of the identified constructs, with the other most widely used tool, the HC-PAIRS, including just three of the 15 second-order constructs. The pre-eminence of these measures and constructs is made more problematic by the common origin of many of their items and the absence of more clinician-oriented constructs. The only exception to this trend is the ABS.mp which has a quite different conceptual profile, which will be discussed further below.

Difference between items derived from patient measures and those developed with some clinician involvement

There was limited evidence about the origin of most items extracted during this review and therefore the conceptual underpinnings for many items were unclear. However, there is a clear distinction between the origin and development of the dominant attitudinal constructs and the more clinician-related constructs which were under represented. The dominant, structural-pathological, constructs represented in the most frequently used measures were adapted from or informed by patient measures with little or no conceptualisation for use in the assessment of HCPs' attitudes and beliefs. There was also little or no evidence of stakeholder involvement as research partners during the development of these items. In contrast, items representing the clinician-related constructs which were under-represented in the extracted items were often developed in association with HCPs. For example, the items developed for the series of studies by

Cherkin and colleagues (see section 3.5.6.2) were informed by discussions with family physicians and chiropractors about how they managed patients with back pain (Cherkin et al. 1988). Similarly, the development of the ABS.mp, the only measure to include the constructs 'role of clinician or (desirable) clinical actions/behaviours' and 'clinician confidence and comfort (with managing common MSK pain)', was also informed by previous qualitative interviews with MSK HCPs (Pincus, Vogel, Santos, et al. 2006; Pincus, Vogel, Breen, et al. 2006). These interviews concerned the reasons HCPs continue to treat LBP patients whose pain is not improving. Although this was not a purposive conceptualisation of HCPs' attitudes and beliefs about MSK pain, it clearly demonstrates the difference in the constructs derived from clinician involvement. These constructs may arguably be considered to have greater clinical validity, and highlights the importance of HCP stakeholder involvement in any future conceptualisation of HCPs' attitudes and beliefs.

3.6.2 Strengths and limitations of this scoping review

3.6.2.1 Strengths

This study was conducted using the recommended methodological framework for scoping reviews (Arksey & O'Malley 2005; Levac et al. 2010), by including a comprehensive search strategy applied to multiple, relevant electronic databases and independent reviewers for each stage of screening and data extraction. In order to identify all relevant published studies, the search strategy was designed to be highly sensitive and despite some pragmatic restrictions which are discussed below, the search was inclusive. Although this approach may have provided a low level of precision, as evidenced by the large number of irrelevant studies identified, no further relevant studies were identified within the

references of the included studies which provides some assurance that the search met the aim of being comprehensive. In addition, an updated search was undertaken to ensure the currency of this current review (see section 3.6.4). No new attitudinal constructs were identified providing some indication that the findings of this review have not been extended since the original search was conducted.

3.6.2.2 Limitations

In common with all reviews of published studies, the possibility of publication bias cannot be excluded, since it is acknowledged that studies with significant or noteworthy results are more likely to be published and identified (Song et al. 2013). However, this is unlikely to have affected the findings of this review in a meaningful way for two reasons. Firstly, the data of interest were not the findings of the included studies but the attitudinal constructs they utilised. Secondly, as the majority of constructs identified featured in multiple studies, then it is arguably less likely that the attitudinal constructs utilised in a missing study would be unique.

There are recognised challenges of balancing the breadth and comprehensiveness of a scoping review with feasibility (Levac et al. 2010). Consequently, a number of restrictions were placed on the search for pragmatic reasons. These were the exclusion of unpublished and 'grey' literature and studies published in languages other than English. The search was also limited to studies published after 1977, meaning relevant studies published before this date may have been missed. However, this is again considered unlikely as the earliest study to be included in the review was published in 1984 and no earlier work was cited by studies included in the review. Another similarly pragmatic limitation was that the initial title

screen was conducted by a single reviewer (KD) due to the lack of second reviewer capacity to ratify this stage in the same way as the abstract review. Although the risk of eliminating potentially relevant titles was recognised and the exclusion criteria therefore applied conservatively, it is nonetheless possible that relevant titles were excluded. However, as described above, if this had happened it is unlikely to have impacted the results of this study significantly due to the identification of each unique attitudinal construct in multiple studies.

A further potential limitation is in relation to establishing the inclusion and exclusion criteria for studies, which may have resulted in the exclusion of potentially relevant studies. Studies which solely quantified self-reported clinical behaviour were also excluded, on the basis that while shown to be associated with HCPs' attitudes and beliefs, self-reported clinical behaviour could not be considered to be a direct proxy. During the course of the review it also became evident that there is considerable conflation of related terms in the literature, with attitudes, beliefs, knowledge and self-reported clinical behaviour all varyingly employed. There were several instances when items described as attitudinal in one study were identified as knowledge or behavioural items in another. Given the decision to only include items identified clearly as attitudinal by the authors of the individual studies, it is possible that the prevalence of identified constructs may have been under-represented, or attitudinal constructs may not have been identified if they were not labelled as such in the source study.

3.6.3 Research and clinical implications

3.6.3.1 Clinical implications

HCPs' attitudes and beliefs are known to be important in clinical behaviour (Darlow et al. 2012; Pincus 2013), and clinical practice can potentially be informed by the wide range of attitudinal constructs identified in this scoping review. Therefore, the available measures which focus on a limited number of constructs represent a narrow version of clinical reality. The lack of a robust and comprehensive measure means that it is currently not possible to fully evaluate clinicians' attitudes and beliefs about common MSK pain in a clinical context. Implementation of evidence-based clinical guidelines has been shown to be variable and the attitudes and beliefs that HCPs hold is one barrier to this (Bishop et al. 2008). Appropriate training in the biopsychosocial approach is a priority. However, without an attitudinal tool which includes the biopsychosocial constructs being targeted in the training, it is impossible to determine the effectiveness of that training.

By extension, as the full range of potentially relevant constructs have not been included in the evaluation of HCPs' attitudes and beliefs, it is not possible to determine which might be key constructs in determining how HCPs operate within a clinical environment and therefore which should be targeted in HCP training programmes.

3.6.3.2 Research implications

The results of this study confirm that very few biopsychosocial attitudinal constructs have been used in the study of HCPs' attitudes and beliefs about common MSK pain to date. As a consequence, HCPs' attitudes and beliefs about common MSK pain are poorly understood. One specific limitation is that many items which have been used to suggest

biopsychosocial clinical beliefs remain framed in the limited dimensions of the structural-pathological model i.e. the cause and consequence of MSK pain (see section 3.6.1.1). The lack of any existing valid biopsychosocial attitudinal items means that these will need to be developed in order to construct a measure of HCPs' biopsychosocial attitudes and beliefs about MSK pain. The first stage of which will require the development of a clear conceptual framework of biopsychosocial clinical orientation; which is also absent in the literature.

The disparity in representation of attitudinal constructs was not confined to biopsychosocial constructs specifically, with the findings demonstrating the dominance of a narrow range of structural-pathological and fear-avoidance constructs and under-representation of clinician-oriented items. The increasing use of a small number of conceptually limited measures was implicated in driving this disparity. While the benefits conferred by using comparable measures across studies were acknowledged, the fact that these studies are capturing only a narrow range of HCP attitudinal constructs needs to be considered when interpreting these results. There is also a danger that the under-representation of potentially pertinent clinician attitudes and beliefs will be perpetuated if researchers: a) continue to rely on these conceptually narrow measures and b) fail to develop more comprehensive and valid measures. Further work is therefore required to explore the attitudinal constructs pertinent to clinical orientation.

3.6.4 Additional relevant papers published since this review was undertaken

An updated search for literature was completed in order to ascertain whether any additional attitudinal constructs could be identified and to ensure the currency of the subsequent studies completed in this PhD programme. The search was repeated using the

original search strategy included at appendix 2, but for pragmatic reasons conducted in Medline and CINAHL only. Search limits applied were: titles only and studies published in English between January 2012 and December 2015. A further 142 studies were identified. One reviewer (KD) followed the rounds of screening described in section 3.4.1.3. Following removal of duplicates (n=49), irrelevant titles (n=56) and abstracts (n=10) and full-text articles (n=4), 23 additional articles were included in the scoping review. The characteristics of these additional studies can be found at the end of appendix 4. Twenty of 23 studies had used one or more of the recognised formal measures of attitudes identified in the earlier review i.e. the PABS was used in 12 studies (Demmelmaier et al. 2012; Magalhães et al. 2012; Simmonds et al. 2012; Hendrick et al. 2013; Rebbeck et al. 2013; Dalkilinc et al. 2014; Mackey & Hurley 2014; Mutsaers et al. 2014; Sit et al. 2015; Innes et al. 2015; Beneciuk & George 2015; Jacobs et al. 2015), the BBQ in six studies (O'Sullivan 2012; O'Sullivan et al. 2013; Tan et al. 2014; Beales et al. 2015; Gremeaux et al. 2015; Tan et al. 2015), the FABQ in four studies (Domenech et al. 2013; Tan et al. 2014; Gremeaux et al. 2015; Tan et al. 2015), the HC-PAIRS in six studies (Magalhães et al. 2012; Domenech et al. 2013; Cross et al. 2014; Mutsaers et al. 2014; Beneciuk & George 2015; Jacobs et al. 2015) and the TSK in one study (Dalkilinc et al. 2014). Shaheed et al. (2015) used the Pharmacist Back Belief Questionnaire which was an amalgamation of items from the BBQ and an 11 item "Buchbinder scale" (Buchbinder et al. 2009), which had both been identified in the original scoping review. Valjakka et al. (2013) had used just the psychological subscale of the ABS-mp, a measure identified in the original scoping review (Valjakka et al. 2013). One additional attitudinal new measure of attitudes and beliefs, the Medical Condition Regard Scale (MCRS), was identified (Hirsh et al. 2014). The MCRS is an

11-item measure of clinicians' biases, emotions, and expectations generated by any medical condition descriptors (Christison et al. 2002). Example items include: "I prefer not to work with patients like this" and "Working with patients like this is satisfying". Participants rate each item on a 6-point Likert scale from "strongly disagree" to "strongly agree." Scores on the individual items are averaged together, with total scores ranging from 1 to 6. Lower scores indicate more negative attitudes about patients with a medical condition.

From these 23 papers, 488 items were identified. Of these only the 11 items from the new measure, the MCRS, were identified as unique items. One of these items, "Insurance plans should cover patients like this to the same degree that they cover patients with other conditions" was not allocated because it related to insurance cover rather than clinical practice. Consequently only 10 items were allocated within the current framework (see table 3.3). All 10 items were allocated to the second-order construct "Clinician confidence and comfort with managing common MSK pain". This increased the total number of items in this first order construct to 51, the total number of unique items to 27, and a total of 18 studies undertaking investigation in this area. No new first-order or second-order attitudinal constructs were identified based on this updated search indicating that the scope of research in this area has not been extended since the original search was conducted.

Two important issues have arisen from the updated review. First is the growing effect of formal measures on the trends in the use of attitudinal constructs. In total, 22 of the 23

new studies used one of the previously identified attitudinal measures, or elements of those measures, thus demonstrating the continued narrowing focus on a few well-recognised measures and their included constructs. In particular, the PABS, the HC-PAIRS and the BBQ have increased in popularity, with the consequence that a relatively narrow range of attitudinal constructs (11 from the 15 constructs identified in table 3.3) are becoming the focus of attitudinal research. Secondly, the emergence of a new measure, the MCRS, in the updated review is the only recent study to undertake investigation in the area of "Clinician confidence and comfort with managing common MSK pain". In Figure 3.7 "Clinician confidence and comfort with managing common MSK pain" was a dominant theme in the early years of attitudinal research up to about 2000, but then appeared to fall out of favour, probably because the ABS-mp has not been utilised in recent years, and it does not feature in any other tool.

3.7 Conclusions

This scoping review has identified 44 first-order and 15 second-order attitudinal constructs which have previously been operationalised in the quantification of HCPs' attitudes and beliefs about common MSK pain. Five of these constructs have appeared increasingly frequently in the literature due to their inclusion in recognised measures of HCPs' attitudes and beliefs, whilst several others have reduced or disappeared from the literature over time. An updated review of more recently published literature has not resulted in any new additional first order constructs. This review provides a critical insight into the origin of these constructs and shows that many have been poorly developed and consequently it is not known which constructs contribute to the valid measurement of HCPs' attitudes and beliefs about MSK pain. Considering the clinical relevance of HCPs' attitudes and beliefs

towards MSK pain and its impact on clinicians' behaviours and potentially therefore patients' outcomes, the key constructs that should be assessed need to be more comprehensively identified in collaboration with, and agreed by, relevant stakeholders. This investigation would provide the basis for a robust, valid measure of HCPs' attitudes towards MSK pain that could be used in future.

The scoping review also identified that the PABS is the most developed and widely used measure of HCPs' attitudes and beliefs, but is conceptually limited in its coverage of attitudinal constructs. Given the results of this scoping review, the next stage of the PhD programme comprised a grounded conceptualisation study using the mixed method of concept mapping with the aim of developing a robust and comprehensive theoretical framework for the biopsychosocial clinical orientation to common MSK pain. This is described in the next chapter and fulfils the critical second stage of the scale development process.

Chapter 4: The development of a conceptual framework for the biopsychosocial clinical orientation to common musculoskeletal pain

Chapter 4: The development of a conceptual framework for the biopsychosocial clinical orientation to common musculoskeletal pain

4.1 Chapter introduction

In chapter 2 it was reported that current measures of HCPs' attitudes and beliefs are of poor or limited quality. In chapter 3 the need to develop a new more comprehensive measure of biopsychosocial clinical orientations towards MSK pain was identified. Although the PABS has been identified as one of the most promising measures of HCPs' attitudes and beliefs, its biopsychosocial subscale may be performing poorly for two main reasons. Firstly, it does not tap sufficient constructs in order to adequately capture the biopsychosocial clinical orientation to MSK pain. Secondly no attempt was made to define a conceptual framework for the biopsychosocial clinical approach to common MSK pain prior to developing the scale. This chapter describes a grounded conceptualisation study using the mixed method approach of concept mapping to develop a comprehensive theoretical framework for the biopsychosocial approach to MSK pain clinical practice. This is the second stage in the scale development process for the PABS-MSK and the findings of this study will be used in subsequent chapters to support the development of a new biopsychosocial scale of the PABS-MSK. Appendices 6 to 10 contain the supporting materials which are referenced within this chapter.

4.2 Conceptualisation for scale development

The importance of clearly defining the construct of interest prior to attempting to develop a measure of it is heavily stressed in the scale development literature (Cronbach & Meehl 1955; Loevinger 1957; Clark & Watson 1995; McGrath 2005); with the subsequent validity of a measure resting largely on the adequate articulation of the target construct (Netemeyer et al. 2003). The term construct is used to refer to a theoretical, or abstract, entity which does not exist as an observable dimension of behaviour (Nunnally & Bernstein

1994). Constructs are described (or conceptualised) in terms of the concepts which they represent or capture (their conceptual domain) (Mackenzie et al. 2011). In this context, concepts are the means of articulating, or labelling, the features or attributes of a construct (Podsakoff et al. 2016) and a conceptual framework represents the relationships between measurement items (or indicators) and the construct to be measured (de Vet et al. 2011).

However, while specifying a conceptual framework for the target construct may be a critical first step, it is also acknowledged to be the most difficult stage in the scale development process (Haynes et al. 1995; Rosas & Camphausen 2007) and is frequently neglected (Mackenzie et al. 2011). The threats to validity associated with inaccurate conceptualisation include: construct under-representation (Messick 1994) and construct-irrelevant variance, where extraneous factors or domains of other constructs are included and effectively lead to more than one construct being represented in the scale and confounding the target construct (Neuberg et al. 1997).

Conventionally, conceptualisation in scale development relies heavily on established theory and literature (Netemeyer et al. 2003; Streiner et al. 2015), however Buchbinder et al (2011) caution that the use of existing or convenient literature or instruments may not provide a complete view and is likely to be incomplete in unknown ways (Buchbinder et al. 2011). The risk associated with developing a conceptual framework based on existing literature only, especially where it is recognised to be incomplete or flawed, is therefore construct under-representation. In response to this threat, a number of authors advocate a grounded, 'validity-driven' approach to conceptualisation which includes consultation with a broad range of relevant stakeholders, a priori hypotheses about the relationships

between items and the recognition that validation of both the conceptual definition and measure of a construct is an ongoing process (Clark & Watson 1995; Buchbinder et al. 2011; Velozo et al. 2012; Osborne et al. 2013).

4.3 Aim and objectives

The aim of this study was to develop a comprehensive and robust conceptual framework for the biopsychosocial clinical orientation to common MSK pain, using a grounded, validity-driven approach. The specific objectives developed to meet this aim were:

1. To identify the most appropriate and effective conceptualisation method
2. To conduct a conceptualisation with a wide range of pertinent clinical stakeholders to inform a conceptual framework that would have broad applicability across HCPs involved in the management of patients with MSK pain

4.4 Conceptualisation methods

Several methods have been used to develop grounded conceptual frameworks for scale development including interviews, focus groups and the Delphi method (Velozo et al. 2012), with each having advantages and limitations. For example, while face-to-face interviews and focus groups provide in-depth examination of participant issues they do not lead to a consensus position, and the synthesis and interpretation of data are subject to researcher subjectivity (Sim & Wright 2000; Bryman 2008). In contrast, the Delphi method may provide a group consensus on a topic; however this is achieved through individual voting, often on predetermined concepts or ideas, and not through new exploration of the breadth and depth of an issue (Murphy et al. 1998). As an alternative, concept mapping has been identified as a method of grounded conceptualisation which allows the full

breadth of a topic to be explored with a group of stakeholders and includes a systematic process for reaching consensus with minimal investigator bias (Caracelli & Riggin 1994; Rosas & Camphausen 2007).

Concept mapping is a structured group conceptualisation process (Trochim & Kane 2005) that is a mixed methods approach, sequentially integrating both individual and group qualitative methods and quantitative multivariate analyses. It was first described by Trochim and Linton (1986) as a systematic, structured methodology for organising the ideas of a group or organisation, and has since become an established and widely used approach in the planning and evaluation of health and social care services (van Bon-Martens et al. 2014; Hackett et al. 2015). For example, concept mapping has previously been used to engage local stakeholders and national experts to define the community and system factors that affect individuals' behaviours related to tobacco, nutrition and physical activity, with the results incorporated into official policy, resource planning and evaluation (Trochim et al. 2004). Concept mapping has also been recognised as a valuable method in other areas of health research and theory building, where the ability to integrate practical and scientific knowledge may be of particular value (Petrucci & Quinlan 2007; van Bon-Martens et al. 2014). Examples include investigation of the personal and societal burden of LBP (Buchbinder et al. 2011) and exploration of stakeholder perspectives regarding barriers to return to work following sickness absence related to major depressive disorder (de Vries et al. 2014).

Concept mapping is considered to be particularly suited to exploratory studies of complex phenomena, as the qualitative elements allow concepts to emerge and the quantitative

analyses provide conceptual organisation of ideas and relationships within the data (Johnsen et al. 2000; van Bon-Martens et al. 2014). Noted strengths of the method include its inherent flexibility, which allows adaptation of the process to the needs of a particular context or participant group, and the relatively short period of time in which the process can be completed (Johnsen et al. 2000; Petrucci & Quinlan 2007). A number of methodological variations have been employed, including the time taken to complete the process (a single or several days) and the use of the same or different stakeholder groups for each step of the process (Buchbinder et al. 2011). The increased availability of information technology has also made it possible for studies to be conducted partially or entirely through web-based applications (Burke et al. 2005; Wallace et al. 2013; Tubbing et al. 2015). Despite this variability in application, it has been demonstrated that the reliability and validity of the method are maintained (Rosas & Kane 2012).

The choice of concept mapping for this study was also informed by the more recent and growing use of concept mapping in scale development (Rosas & Kane 2012; Osborne et al. 2011; Wallace et al. 2013). In a recent evaluation, Rosas & Ridings (2016) identified a number of notable strengths in the use of concept mapping in measurement development. These include: the ability to integrate the perspectives of multiple stakeholders, facilitation of researcher decision-making within the systematic generation and structuring of content, and the production of not just a list of items for populating a scale, but a detailed representational structure based on a gradient of similarity.

As concept mapping is a relatively novel method in MSK research, a summary of the method in general is provided in the following section, with references to sources of more

detailed information. This is followed by the specific methods of this conceptualisation study.

4.5 The concept mapping method

The concept mapping process involves a series of six discrete steps: 1) preparation, 2) generation of ideas (statements), 3) structuring of the statements, 4) analysis and representation of the statements (as a 'map'), 5) interpretation of the map and 6) utilisation (Trochim 1989). The six steps are detailed below, with more information available in the following sources; Burke et al. (2005), Rosas & Camphausen (2007), Trochim & Kane (2005), Kane & Trochim (2007) and Trochim (2016). This description is supported by illustration of the analytical stages of the process in figure 4.1.

4.5.1. Step 1: Preparation

In addition to the logistical arrangements involved in conducting group work, the two main tasks in the preparatory stage are to define the conceptual focus for the group and select stakeholder participants. Sampling is typically non-random in concept mapping, with participants being sought for their particular affiliation, experience or viewpoint and to reflect the full range of opinions on the concept of interest (Trochim 1989). The minimum number of participants considered viable for a concept mapping study is 10 (Kane & Trochim 2007), however different numbers, and in some cases different participants might contribute to the different steps of the process (Trochim & McLinden 2016). There is technically no upper limit on the number of participants that can be involved in a concept mapping process, with larger numbers of participants credited with yielding more information for the analysis and therefore greater clarity of results (Rosas & Kane 2012),

although very large numbers of participants may provide diminishing returns and be more challenging to operationalise (Trochim 1993). However, sample size is also influenced by the aim of the study, the needs of the participants and the modality through which the process is conducted. For example, studies employing web-based methods may be able to include hundreds of participants (Kane & Trochim 2007; Tubbing et al. 2015), while it would not be feasible to include more than 12 to 15 in a face-to-face group concept mapping session (Kane & Trochim 2007).

The focus for the group 'brainstorming', or generation of idea, that follows takes the form of a carefully worded focus statement, designed to elicit participant ideas about the concept of interest (Trochim 1989).

4.5.2 Step 2: Generation of ideas

In this step, the group convenes and generates ideas, or 'statements', in response to the focus statement. This is typically achieved during a closely facilitated face-to-face group session during which Osborn's (1948) "rules for brainstorming" are advocated (Trochim 1989; Kane & Trochim 2007). These call for participants to be encouraged to think as broadly as possible, and generate statements that represent the entire conceptual domain for the topic of interest. Participants then take turns in offering a statement to the group for discussion. However, this discussion is solely to clarify meaning, rather than criticise or question the legitimacy of the statement.

Participants are asked to produce simply worded, 'jargon'-free statements containing just a single idea or concept. This format ensures that the statements are clear, unambiguous and suitable for the sorting task that follows. Ideally, the group process would continue

until it reaches saturation, where no new ideas are produced (Rosas & Kane 2012), and theoretically there is no limit to the number of statements that can be generated (Trochim 1989). However, large statement sets become difficult for participants to manipulate in the structuring step which follows and there may be software or other practical constraints on the size of the statement set. It has been suggested that if a group generates more than 100 statements, then the set should be rationalised prior to the next step. Kane and Trochim (2007) refer to this process as 'idea synthesis', the purposes of which are to: obtain a list of unique ideas (with only one idea represented in each statement), to ensure that each statement is relevant to the project focus, to reduce the statement set to a manageable number and edit the statements for clarity.

4.5.3 Step 3: Structuring the statements

Statement structuring involves two tasks which participants complete individually, firstly rating and then sorting the statements. Each statement is rated, relative to the others, on a dimension or dimensions of interest, such as importance or feasibility. Typically, a five-point adjectival rating scale is used for rating the statements (Trochim 1989), for example: 1 = not important at all, 2 = somewhat important, 3 = quite important, 4 = very important and 5 = extremely important.

Participants are then asked to independently sort the statements into groups based on perceived similarity (see figure 4.1a), therefore capturing individual perspectives about the conceptual relationships within the statement set (Rosas 2012). Conventionally, an unstructured card sorting procedure has been utilised (Rosenberg & Kim 1975) whereby participants are asked to sort the statements "in any way that makes sense to you" while

observing three restrictions: 1) All statements cannot be placed in a single group, 2) All statements cannot be grouped individually and 3) Each statement can be placed in just one sorting pile (Trochim 1989). Participants might also be asked to avoid putting difficult to place items into a 'miscellaneous' pile and invited to assign a label, or theme, to each of their piles of statements (Rosas 2012).

4.5.4 Step 4: Analysis and representation of the statements

In this quantitative stage, the individual participant sort data are combined into a group similarity matrix (see figure 4.1b). This matrix is then subject to two multivariate statistical techniques, non-metric multidimensional scaling (MDS) and hierarchical cluster analysis, thus producing a visual display of the relational structure of the concept as determined by the group (Trochim & Kane 2005) (see figure 4.1c). While it is possible to undertake these analyses using statistical software packages (Trochim 2016), tailored proprietary programs have been developed which conduct the entire sequence of calculations and generate the graphic results. These include several generations of The Concept System software (http://www.conceptsystems.com/gw).

Non-metric MDS is based on the measurement model that assumes that the relative similarity of objects (in this case the frequency with which two statements were sorted into the same group by participants) can be represented in terms of the distance between a pair of points (Kruskal 1964); the points in this instance being the individual statements. This technique creates co-ordinates that are used to plot a 'point map' in which conceptually related statements are placed in close proximity to one another and conceptually dissimilar statements are placed far apart (Batterham 1996) (see figure 4.1d).

Although traditionally MDS might include the examination of a number of different dimensional solutions, concept mapping typically uses a two-dimensional solution thus plotting each statement on an X,Y co-ordinate map (Trochim 1989). This is primarily due to the view that two dimensional solutions are a more appropriate foundation for the subsequent cluster analysis than three or more dimensions (Kruskal & Wish 1978). Two-dimensional maps are also considered the most interpretable representation, which makes them most appropriate for the group concept mapping method, despite not always providing the best statistical fit for the original similarity matrix data (Kane & Trochim 2007).

The goodness of fit statistic generated in MDS analyses is the stress index (Kruskal 1964). High values of stress suggest greater discrepancy between the solution (distances between statements on the map) and the input similarity matrix. Conventionally, it is suggested that stress should be 0.10 or lower (Kruskal & Wish 1978), however this is considered an inappropriate standard in concept mapping (Kane & Trochim 2007). Kane and Trochim (2007) argue that as concept mapping is primarily concerned with relationality (the display of relationships) rather than dimensionality, while high stress may indicate greater conceptual complexity and/or considerable variability in sorting, lower stress may not suggest a 'better' or more interpretable map. In a meta-analysis of a range of concept mapping studies, Trochim (1993) found mean stress to be 0.284 (standard deviation 0.04) (Trochim 1993). The subsequent observation that 95% of concept mapping studies are likely to yield stress values in the range of 0.205 and 0.365 is presented as indicative of the degree of stress which can be accommodated in the concept mapping process.

Hierarchical cluster analysis is then conducted on the MDS X,Y coordinates for each statement which groups the statements in the point map into clusters which reflect similar concepts (Everitt 1980) (see figure 4.1e). Trochim (1989) advocates the use of Ward's algorithm for cluster analysis due to its suitability for working with distance-based data and the more interpretable solutions it produces when compared to other methods.

The resultant cluster map is used as the basis for discussion in the final, qualitative, group interpretation stage. However, the hierarchical cluster analysis can provide as many 'solutions' as there are statements as it employs an agglomerative process which initially places all the statements in their own separate cluster and sequentially combines two clusters until all the statements are in a single cluster (Fraley & Raftery 1998). It is acknowledged that there is no simple way to determine the 'correct' cluster solution to present for group interpretation, and that this decision is determined by a process which is influenced by researcher subjectivity (Kane & Trochim 2007). However, there are a number of strategies that can be employed to ensure that the decision is reached in as transparent a way as possible.

Kane and Trochim (2007) describe an approach whereby the upper and lower limits are set for the number of clusters that would be desirable based on theoretical or practical considerations. Each successive cluster solution (a splitting of two clusters, if moving from a low to a high number of clusters) is examined to determine if the split is conceptually sensible and enhances the explanatory power of the map. As each cluster split is essentially mathematical and forced, there will come a point in this process where the splits start to reduce the theoretical interpretability or utility of the map. The most theoretically

coherent cluster solution is therefore deemed to be the one where there is a shift from cluster splits that make sense and add value, to splitting that does not.

Some authors have advocated the involvement of participants in this process, although it is acknowledged that this is not always feasible (Jackson & Trochim 2002; Kane & Trochim 2007). The method outlined above is time consuming, and is not appropriate for concept mapping processes being conducted in a short period of time, for example in a single day. In these situations, investigators have either used the cluster solution that is equivalent to the maximum number of groups created by a participant in the structuring phase, or that contains a number of clusters that is approximately one-fifth of the number of statements generated by the group (Osborne et al. 2007).

4.5.5 Step 5: Interpretation of the maps

In this step the participants once again work together in a structured and facilitated group process, the primary function of which is to determine the conceptual meaning of the map produced by the quantitative analyses (Rosas 2012). Kane and Trochim (2007) identify this as the key stage in the concept mapping process, where the accuracy and legitimacy of the conceptualisation is established by the group.

In preparation for this step, participants are provided with the concept cluster map and the accompanying statement list. The first action for participants in the interpretation session is to assign a thematic label for each of the clusters in the map which is super-imposed onto the map. They may also be encouraged to consider the structure of the map and whether there are meaningful groupings of clusters, or regions within the map (Johnsen et al. 2000). Trochim and Kane (2007) stress that the group members are also free to rearrange the map

until it makes sense to them; stating that a "computer generated algorithm should not determine conceptual structures without the judgment of the participants" (p.131). This might be the case if, for example, a statement does not seem to 'belong' in a cluster or the group believes that the conceptualisation would be better represented if a cluster is split in two, or merged with another. During this process, all amendments are agreed by the group and recorded on the map which should also be displayed to the group.

4.5.6 Step 6: Utilisation

The final documented step of the concept mapping process is to determine the way in which the map will be used to achieve its original purpose (Trochim 1989). For example, as in this thesis, the concept map may provide a framework from which to develop a measurement tool. The following section describes the methods and results of the concept mapping process conducted within this PhD programme.

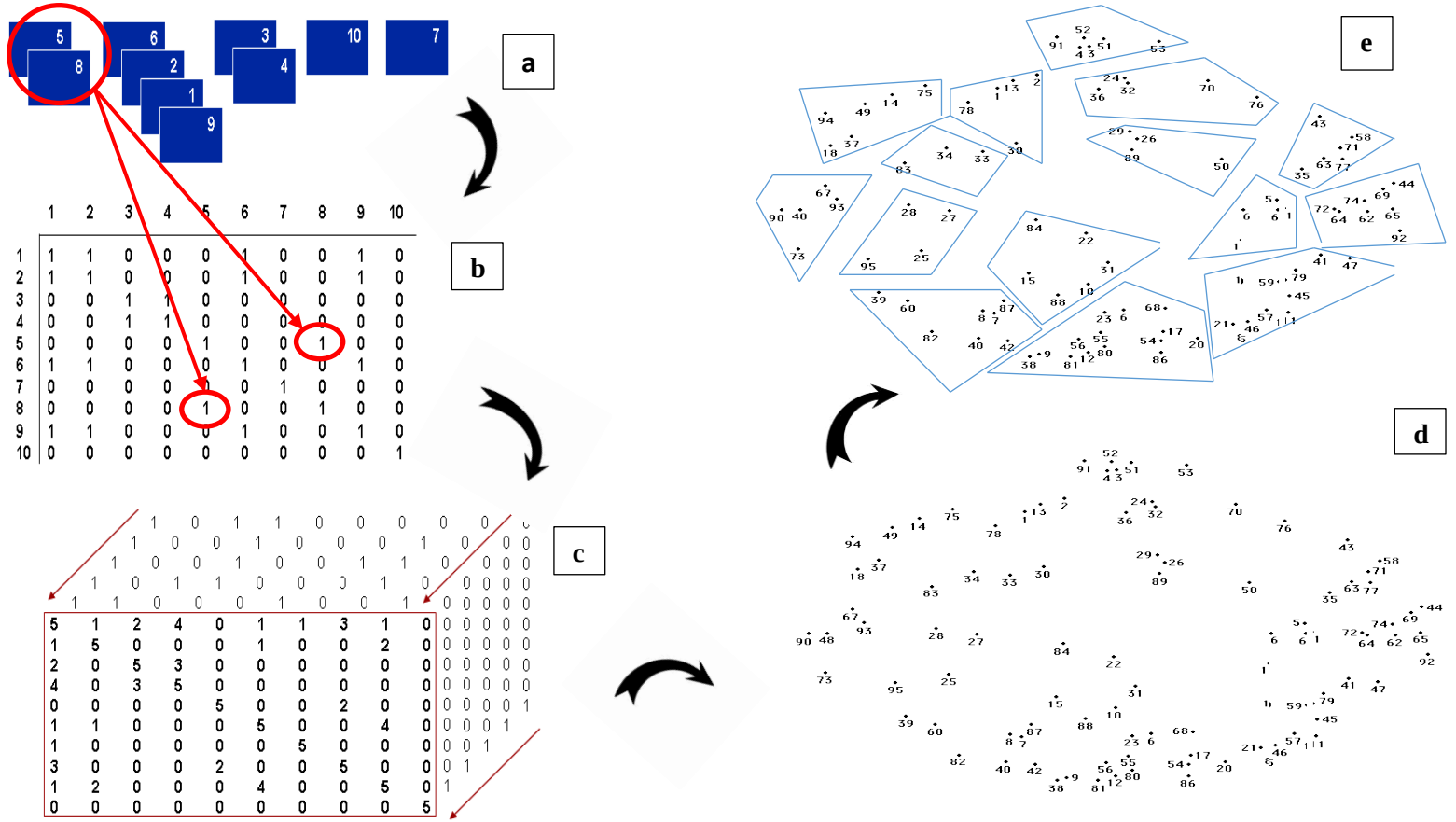


Figure 4.1: Overview of the analytical stages of concept mapping

a. Statement sort of a single participant; **b.** Single statement sort forms a matrix (1 indicates statements which were sorted together); **c.** All participant sort matrices combined to form group similarity matrix (figure represents combination of five individual sorts); **d.** Example of a point map; **e.** Example of a cluster map

Figures based on http://www.socialresearchmethods.net/mapping/mapping.htm#Presentations

4.6 Methods

4.6.1 Study design

This was a sequential, descriptive mixed methods study using concept mapping. Two parallel concept mapping processes were undertaken with a local and an international stakeholder group of experienced MSK clinicians and researchers, the outputs from which were merged to develop an overall conceptual framework for the biopsychosocial clinical approach to MSK pain. Although the development of each of the contributory concept maps were separate processes, due to the novelty of the research method, the experience gained in one group was occasionally used to inform or refine the same step of the process in the other group. This was to ensure the processes were as clear as possible for participants. The timeline for the two group processes is illustrated in figure 4.2. Ethical approval for the study was granted by Keele University's Ethical Review Panel (see appendix 6). This study was led by the author (KD), however due to the potentially subjective nature of a number of key points in the process two further investigators (AB and NF) were involved in order to limit potential researcher bias.

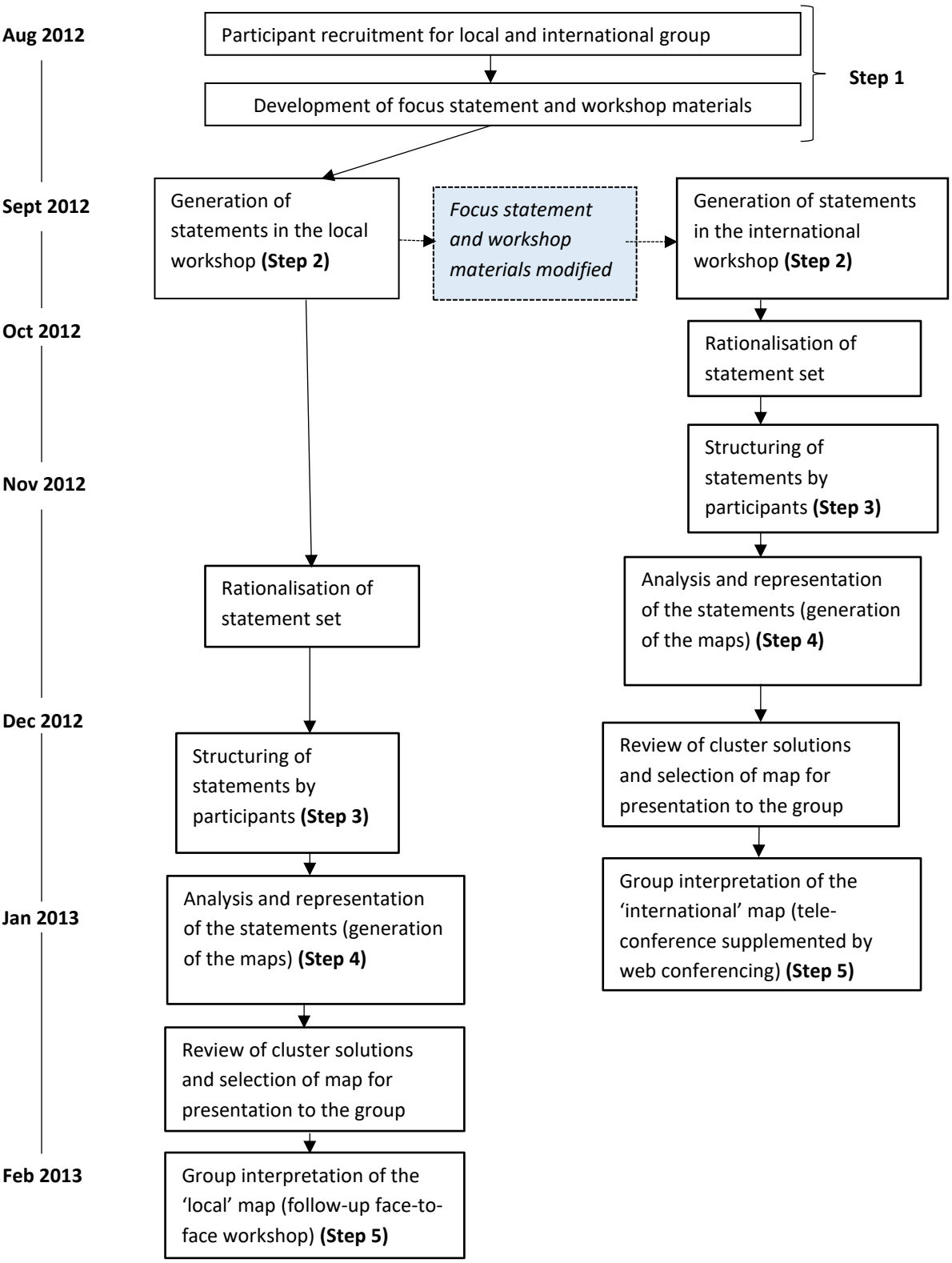


Figure 4.2: Flowchart of the timeline and key steps of the two parallel concept mapping groups

4.6.2 Step 1: Preparation

4.6.2.1 Selection and recruitment of participants

The overall aim of this PhD programme of research was to develop a measure of HCPs' attitudes and beliefs that will have utility across a range of HCPs working with people with MSK conditions, in a variety of settings both in the United Kingdom (UK) and internationally. It was therefore important for participants to represent the widest range of clinical stakeholder perspectives as possible. Participants from both clinical and research backgrounds were therefore purposively sought from a range of health professions and recruited to either the local or the international group workshop.

There is growing recognition of the importance of, and priority afforded to the involvement of patients in healthcare research (Ives et al. 2013). Early in the design of this programme of work, informal feedback on these plans was sought from the research user group within the Institute of Primary Care and Health Sciences (iPCHS) who felt the work was necessary and would have 'downstream' benefits for patients. However, the construct of interest within this scale development process is HCPs' attitudes and beliefs; and while these undoubtedly impact on patients, who in turn will have their own beliefs and preferences about desirable HCP attitudes, they fall outside the construct itself. The inclusion of patients as stakeholders within this conceptualisation process was therefore not indicated.

Local group

Participants in the local group workshop were individually identified and invited from the staff of the Arthritis Research UK Primary Care Centre in the Institute of Primary Care and Health Sciences at the Keele University, UK. The Centre is an internationally recognised

centre of excellence in MSK healthcare research, with a multi-disciplinary staff of clinicians and researchers. The selected invitees were either practising clinicians, or had a substantial clinical background in physiotherapy, occupational therapy, general practice or clinical psychology. The workshop took place in September 2012.

International group

The international group workshop was conducted at the 12th International Forum on Back Pain Research in Primary Care (Odense, Denmark) in October 2012. The Forum was chosen as the venue for this workshop for three main reasons: 1) The key theme at the Forum was the re-examination of the biopsychosocial model in research and clinical practice, marking the 25th anniversary of Gordon Waddell's landmark paper "A New Clinical Model for the Treatment of Low-Back Pain" (Waddell 1987); 2) the Forum has historically attracted delegates from a wide range of clinical backgrounds who are involved in the management of patients with common MSK pain (not only LBP) and 3) participatory workshops have been successfully conducted at the Forum in the past, including a previous concept mapping workshop (Buchbinder et al. 2011). Forum delegates had the choice of attending one of four simultaneous workshops, one of which was involvement in this concept mapping study. A description of the workshop appeared in the Forum programme, therefore delegates self-selected to participate in the workshop.

4.6.2.2 Development of the focus statement

The focus statement for both groups was developed through discussion within the investigative team (KD, AB and NF). This was to ensure that it was clearly worded and that there were no words or phrases that might have different meanings in different contexts,

The focus statement for both the local and international group workshops was:

> "*Thinking as broadly as possible, generate statements that describe what a clinician who follows a biopsychosocial approach could consider relevant in common musculoskeletal pain problems".*

As described in section 4.5.1, the focus statement is used to elicit participants' opinions about the topic, which they are asked to convey in 'jargon'-free statements containing a single idea or concept. However, reflecting on the statements generated in the local group workshop (which was conducted first), it was apparent that the participants had struggled to articulate their ideas in this way. This was evidenced by the number of very complex or multi-conceptual statements that were developed and had to be subsequently re-worded, or removed during the rationalisation of the statement set. As a result, and considering that participants within the international group would not all have English as a first language, small changes were made to the pre-workshop information that was sent out to the international workshop participants. This included greater emphasis on the required format for statements and the provision of an additional focus prompt, or sentence. The focus sentence read as follows: "*A clinician who follows a biopsychosocial approach could consider…… (your statement here) ….. relevant in common musculoskeletal problems"* and was provided with two examples of statements generated in the local group workshop.

4.6.3 Step 2: Generation and rationalisation of the statement sets

4.6.3.1 The statement generation workshops

The local group workshop was facilitated by all three members of the investigative team (KD, AB and NF). This encouraged consistency of the investigators' facilitation style in

preparation for the international group workshop which followed. To allow the best possible use of time with the larger international group, participants were allocated to one of three smaller groups for the workshop activity. Each group was facilitated by one of the investigative team and an invited co-facilitator. The co-facilitators were three of the Forum conference keynote speakers who were due to each present on one of the three components of the biopsychosocial model within the plenary sessions of the conference programme.

Both workshops were conducted in 90 minutes which was the maximum time available for the international workshop. However, to ensure the most efficient use of time, both groups were provided with information about the study, the focus statement and participant information and consent forms in advance of the workshops. These workshop materials are included in appendix 7. Each workshop began with a brief overview of the concept mapping method, the 'rules' for the group work and the required format for the generated statements (as described in section 4.5.2). Each then proceeded as follows:

- Participants were given a short period of time to work individually on generating and or refining their statements
- A volunteer was asked to offer a statement from their list to the group
- The wording of the statement was agreed by the group, after which it was entered into a Word document on a laptop and projected to the whole group
- The next participant was then invited to offer a statement and the process continued until the end of the workshop

Neither group exhausted the participants' lists of statements or reached saturation in terms of the statements being included, within the time limit of the workshops. Therefore, in order to ensure the full set of statements generated by the groups could be included, participants were invited to submit their additional statements to the facilitators at the end of the group session. The submission of statements outside the formal group process is not unprecedented as Kane and Trochim (2007) discuss the potential for participant contribution in this way and more recent work has relied solely on statement generation outwith the facilitated group process (Buchbinder et al. 2011).

There was an additional step in statement generation which was applied to the local group only. As mentioned above, participants in this group had struggled to formulate their ideas with the level of simplicity that the concept mapping method requires and many of the written statements submitted contained more than a single concept, or rather complex language. Therefore statements submitted in writing were returned to the participant who submitted them and they were invited to re–format the statements with the additional insight into the process provided by having participated in the group workshop.

4.6.3.2 Rationalisation of the statement sets

For both groups, the statements generated in the workshop and those submitted in writing were combined. This produced large pools of statements from both groups which were then subject to a process of rationalisation, or 'idea synthesis' (Kane & Trochim 2007), as described in section 4.5.2.

The primary aim of this process was to reduce the statement set to a size which would be more manageable for participants in the next step of the concept mapping process and

which would be compatible with the Concept Systems software (Concept Systems Inc. NY); a maximum of 99 statements could be entered into the software. However, it was also an opportunity to remove duplicate concepts and poorly constructed or unclear statements. In order to minimise the potential for investigator bias in the reduction and synthesis of the statements and ensure that the wording and meaning of statements remained as close to the original as possible, the rationalisation was conducted by all three members of the investigative team (KD, AB and NF) and a number of a priori criteria were adopted as follows:

- Direct duplicates were removed and conceptually highly similar statements were collapsed. Statements formed from merging a number of statements in this way were then guaranteed a place in the final statement set as they represented the contribution of two or more participants
- Statements were removed if they were ambiguous or abstract (i.e. lacking meaning or context), conceptually very broad, or multi-conceptual (unless it was possible to split the statements and still retain the meaning of the constituent parts) or if they lacked relevance for all contexts; for example, if a statement was exclusively applicable to the UK or the NHS
- Statements were re-worded only to enhance their clarity or to enable duplicated concepts to be merged into a single statement. However, original phrasing was retained where possible and no change was made to their meaning. Examples of this process are provided later in table 4.2 in the results section
- If the team were unable to refine or reduce a statement, it was retained

4.6.4 Step 3: Structuring of the statements

Once the final set of statements from each group was determined, the participants were asked to structure the statements developed within their group workshop. As described in section 4.5.3 this step comprised two distinct tasks, first rating and then sorting the statements into thematic, named groups.

Participants in both groups were sent comprehensive instructions for structuring the statements, a worked example (drawn from the same published study previously used as the source of example statements, (Batterham 1996)) and the statements in an Excel spreadsheet. Participants were asked to rate statements for their relative importance. Statements were rated on a 5-point Likert scale where 1 = not important at all, 2 = somewhat important, 3 = quite important, 4 = very important and 5 = extremely important.

4.6.5 Step 4: Analysis and representation of the statements

Once returned, each participant's statement ratings and thematic sort were entered into the Concept Systems software which was used to conduct the multivariate statistical analyses and generate the point and cluster maps. The cluster solutions for each group were then examined and the most appropriate for use in the group interpretation chosen. Due to the time available between the statement generation and map interpretation workshops, it was possible to use a derivative of the approach advocated by Kane and Trochim (2007) and outlined in section 4.5.4, whereby successive cluster solutions are examined for theoretical coherence. The three-cluster solution was considered to be the theoretical minimum due to the tripartite nature of the biopsychosocial model. Three was also the smallest number of statement groupings returned by a participant in the statement

structuring step. The largest number of statement groupings returned by a participant in each group was used as the maximum number of clusters examined for that group.

Working from the smallest to the largest number of clusters, the map and the cluster list (the statements included in each of the clusters) for successive cluster solutions were examined for interpretability and theoretical coherence, and the 'tipping point' between increasing, static or reducing theoretical coherence was determined for each group. This task was undertaken by KD and the decision ratified through discussion with AB.

4.6.6 Step 5: Group interpretation of the concept map

In preparation for this stage all participants in the original statement generation workshops were sent the selected cluster map and cluster list for their group. Participants did not have to have engaged in the earlier statement structuring to be eligible to participate in the interpretation stage.

The interpretive discussion with participants from the local group took place in a follow-up, face-to-face workshop within the Institute for Primary Care and Health Sciences. The international group interpretation was conducted via a telephone-conference, supplemented by the screen sharing facility of a web-conferencing programme (www.anymeeting.com).

Both the local and international interpretation meetings were two hours long and were co-facilitated by KD and AB. The map which had been previously distributed to the group was displayed throughout the discussion and any amendments made to the map, or key points of discussion, were documented and displayed to all participants contemporaneously.

The discussion was facilitated in concordance with the method described in section 4.5.5, starting with labelling the clusters. Once cluster labelling was complete, the cluster or area of the map that had provoked the most discussion, or was most difficult to label, was identified and used as the starting point for a more in-depth discussion of meaning and content. During this discussion, statements that would be better placed in a different cluster were identified and relocated and, if necessary, reconfigured to enhance the conceptual clarity of the map. Discussion was subsequently targeted at the areas of the map that required the greatest attention as the interpreted map evolved.

Following the group interpretation sessions, a descriptive narrative of the discussion was compiled as a record of the decisions made by the group and the amended map and cluster list were circulated to the participants for their ratification. The median importance rating for the statements included in each cluster in the final maps were also calculated using the median participant rating for each statement.

With the generation of two distinct concept maps complete, the next step in this study was the synthesis of the two separate maps to create an overall conceptual framework for the biopsychosocial clinical approach. This final step is described below.

4.6.7 Step 6: Utilisation - Synthesis of the two maps to create the overall conceptual framework

The synthesis of maps produced from multiple, separate groups is not a prescribed step in the concept mapping method. Therefore, although there are a number of studies that have merged multiple concept maps in this way, there is no consensus on the most appropriate method to do so. One approach adopted by some investigators has been to repeat the MDS on the original sort data after the group interpretation, looking at three and four-

dimensional solutions which they suggest may provide clearer cluster solutions (Batterham et al. 2002; Buchbinder et al. 2011; Busija et al. 2013). These authors also conduct an examination of successive cluster solutions for substantive meaning after their group interpretation session with the aim of identifying the more general concepts (represented by a small number of clusters) which tend to be similar across different groups.

However, in these studies the group statement generation and interpretation workshops have often been conducted on the same day. This means that the map provided to the group for discussion is created by default (usually the number of clusters equal to one fifth of the statements generated) and will therefore not necessarily be the most theoretically coherent. The timing of the group workshops in the current study allowed examination of different cluster solutions before the group interpretation (as described in section 4.6.5), therefore providing the group with the most theoretically coherent map for discussion. In addition to providing labels for each cluster, both groups made a number of significant changes to the map in terms of the position of statements and cluster configuration. It was decided that this interpretation should be protected within the synthesis process for two reasons. Firstly, having engaged an expert group in the interpretation of the map, their input should not be lost by returning to the original sort data as the basis for merging the maps and secondly, preserving the group's interpretation also limited the potential for investigator bias in the synthesis process.

The general approach taken to the synthesis of the maps was thematic, in keeping with that of previous studies (Batterham et al. 2002; Busija et al. 2013). Firstly, both maps were examined for areas of conceptual similarity. These broad areas of similarity allowed several

clusters from each map to be examined together and therefore provided a feasible initial unit of synthesis. The clusters were 'anonymised' by KD to reduce their association with the group in which they were generated and maintain the focus on their thematic content.

To minimise investigator influence in the synthesis, a number of aims and procedural steps for the process were established a priori and are detailed in box 4.1. This process was undertaken separately by the members of the investigative team (KD, AB and NF). To allow distinction between the clusters generated by the concept mapping process and the conceptual groupings produced as a result of merging the two maps, the latter will be described as domains.

The purpose of selecting representative statements for each theme identified was twofold: First to characterise the identified theme and second to provide potential candidates for the scale item generation process which followed.

Aims

- To ensure that the conceptual content of both maps is fully represented in the synthesis
- Retain as much of the original content and structure of the contributory maps as possible
- Alter participant determined labels and language as little as possible
- Select a representative statement for each domain identified in the overall framework

Synthesis process

For each of the primary domains, each investigator independently:

- Examined the cluster lists for the statements assigned to the domain in each map
- Identified common themes that captured concepts included across the two maps
- Identified representative statements for each theme

Criteria for selection of representative statements

- Contain a concept that appears in both contributory maps
- Uni-conceptual, clear and directly represent the domain in question
- Pertinent to all MSK clinical contexts

Box 4.1: The aims and procedural steps established for the synthesis of the two maps

The investigators examined the contributory clusters and identified themes independently, which were then discussed and agreed. The themes were then used by KD to develop a final synthesis of the two maps, during which it was ensured that all the statements in both maps were allocated or accounted for. This overall conceptual framework for the biopsychosocial clinical approach was then ratified with the other members of the investigative team (AB and NF).

4.7 Results

The results section first describes the characteristics of the participants followed by the results from the generation, rationalisation and structuring of the statements. The concept maps produced from the two group processes and their interpretations are then presented. This section also includes a summary of the key discussion points from the interpretation workshops in order to provide insight into the discussion that informed the groups' decision-making. Finally, the full conceptual framework is provided with a number

of examples of the way in which themes were identified and synthesised across the two maps.

4.7.1 Participant characteristics

All participants in this study were experienced musculoskeletal clinicians and/or researchers who had either accepted an invitation to participate in the workshop, in the case of the local group, or who had chosen to attend the workshop at the International Forum on Back Pain Research in Primary Care (Odense, Denmark) in October 2012. The characteristics of the 40 participants of the two initial statement generation workshops are summarised in table 4.1 below.

4.7.2 The generation, rationalisation and structuring of the statements

4.7.2.1 Local group

In total, 36 statements were developed during the local group workshop. In response to the invitation to amend and re-submit any of the written statements submitted after the workshop, seven participants returned a list of amended additional statements and four participants responded that they were happy for the statements to be included in their existing format. Three participants did not respond, however their statements included a number of concepts that had not been contributed by others, and were considered to be potentially highly valuable. Therefore, these statements were also included in their original format. A further 243 statements were submitted in writing giving a total initial local group statement set of 279.

Table 4.1: Characteristics of the participants in the two statement generation workshops

		Local Group n = 14	International Group n = 26	TOTAL n = 40
Gender	**M**	5 (35.7%)	14 (53.8%)	19 (47.5%)
	F	9 (64.3%)	12 (46.2%)	21 (52.5%)
Clinical Background		Physiotherapist – 9 (64.3%) Occupational Therapist – 1 (7.1%) General Practitioner – 1 (7.1%) Clinical Psychologist – 1 (7.1%) Non-clinical (Health Psychology background) – 2 (14.3%)	Physiotherapist – 8 (30.8%) Occupational Therapist – 1 (3.8%) Chiropractor – 7 (26.9%) General Practitioner – 1 (3.8%) Orthopaedic Surgeon – 1 (3.8%) Rheumatologist – 1 (3.8%) Physiatrist – 1 ((3.8%) Nurse – 1 (3.8%) Dietician – 1 (3.8%) Alexander Technique practitioner – 1 (3.8%) Human Movement Scientist – 1 (3.8%) Dual background (Physiotherapy/Chiropractic) – 1 (3.8%) Non-clinical – 1 (3.8%)	17 (42.5%) 2 (5.0%) 7 (17.5%) 2 (5.0%) 1 (2.5%) 2 (5.0%) 1 (2.5%) 1 (2.5%) 1 (2.5%) 1 (2.5%) 1 (2.5%) 1 (2.5%) 1 (2.5%) 1 (2.5%)
Proportion of participants' current, primary occupational role spent in research or clinical work		100% research – 7 (50.0%) ≥ 50% clinical – 3 (21.4%) ≤ 49% clinical – 4 (28.6%)	100% research – 6 (23.1%) ≥ 50% clinical – 10 (38.5%) ≤ 49% clinical – 5 (19.2%) NB: No information for 5 participants	13 (32.5%) 13 (32.5%) 9 (22.5%)
		There were no participants working exclusively in clinical practice. Those involved in clinical work also had secondary roles in research, teaching or management.		
Setting of current (primary) occupational role		Primary care, University or both	Highly varied and spread across primary, secondary and tertiary care, other clinical settings (private practice) and educational settings	
Years since qualification:				
0 - 5		-	2 (7.7%)	2 (5.0%)
6 - 10		1 (7.1%)	3 (11.5%)	4 (10.0%)
11 - 15		3 (21.4%)	2 (7.7%)	5 (12.5%)
16 - 20		1 (7.1%)	5 (19.2%)	6 (15.0%)
21 - 25		2 (14.3%)	3 (11.5%)	5 (12.5%)
26 - 30		-	5 (19.2%)	5 (12.5%)
≥ 30		3 (21.4%)	1 (3.8%)	4 (10.0%)
		NB: Qualification information incomplete in both groups		

Following the rationalisation process described in section 4.6.3.2, the 279 statements were reduced to 98. Two examples of the way in which multiple contributory statements were 'collapsed' into a single statement are illustrated in table 4.2 below. Statement 4 is

representative of the situation where a number of contributory statements were judged to represent the same concept. The exact wording of, in this case two statements, was used to represent the concept in the final set of statements. Statement 33 is an example of a larger number of contributory statements concerning a conceptually similar idea. However no single statement had precisely the right wording to accurately represent all the contributory statements and therefore a new statement was created to represent the concept of 'usual activities', which was considered to be the common theme.

Table 4.2: Examples from the rationalisation of the local group statements

Statement no.	Final statement	Contributory Group Statements
4	The emotional state of the patient	5 The emotional state of the patient 91 The emotional response to the problem 103 The emotional state of the patient 199 How an individual's emotional state can influence their success of treatment
33	The patient's ability to undertake their usual activities	7 the effect of pain on the person's current patterns of activity 8 the effect of pain on the person's current levels of activity 9 the functional problems experienced in daily life by the person because of pain 25 the effect of pain on the person's roles 41 the effect of pain on productivity (work) 42 the effect of pain on productivity (home – personal and domestic activities of daily living) 43 the effect of pain on leisure activities 97 Activity limitation from the problem 105 Level of interference/impact caused by pain

Twelve participants from the local group (86%) responded to the request to structure (rate and sort) the resultant statement set. There were no sort errors (i.e. a statement put into multiple piles, or not sorted) and therefore all the sorts were admissible.

4.7.2.2 International group

The total number of statements generated by the three groups in the international workshop was 111 (44, 37 and 30 from each of the three groups). A further three statements were contributed verbally after the group session by one participant and a further 112 statements were collected from the participants written lists at the end of the workshop, giving a total of 226 statements.

During the rationalisation process the 226 statements were reduced to 99, primarily through the collapse of the many concepts which were duplicated in the three sub-groups and in the additional written statements. In comparison to the local group, statements from the international group were generally much closer to the required format (i.e. uni-conceptual and simply worded) likely due to the additional guidance and the 'focus sentence' that this group had received prior to the workshop. Ten participants from the international group (38%) provided statement ratings and a thematic sort. However one was inadmissible due to many of the statements being placed in more than one pile, resulting in nine admissible sorts.

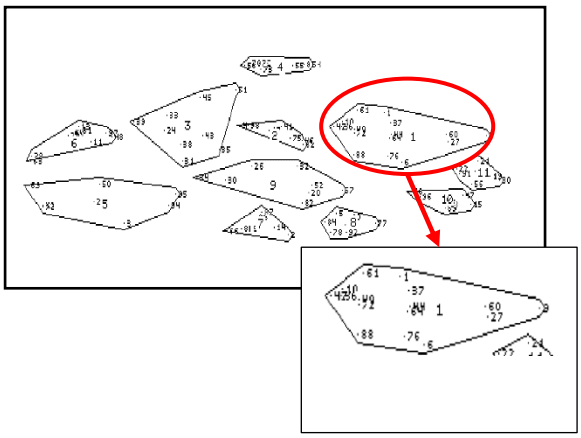
4.7.3 Production and selection of the cluster maps

The point and cluster maps produced as a result of the two-dimensional multidimensional scaling (MDS) performed on both the local and international group data have been included for reference in appendix 8. The stress values of the MDS of the local and international group data were 0.303 and 0.278 respectively, and therefore within the range suggested as being acceptable in concept mapping (Trochim 1993). As described in section 4.6.5 of the methods section above, the three-cluster solution was considered to be the minimum theoretically coherent grouping of the statements for both groups. The maximum number

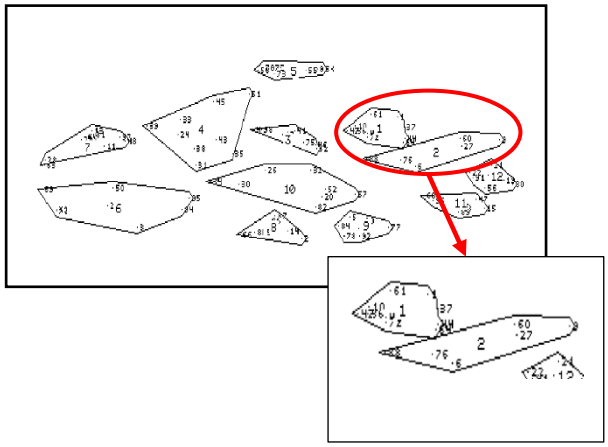
of thematic groupings returned by a participant in the statement structuring step was used as the largest number of coherent clusters. This was 22 for the local group and 19 for the international group.

Examination of successive cluster splits from solutions three to 19 for the international group suggested a general trend of increasing interpretability up to the 16-cluster solution, evidenced by improving clarity and refinement of the concepts represented by the clusters. The split between 16 and 17 clusters was the first to result in reduced coherence, 'forcing' the separation of a previously stable and theoretically homogeneous cluster (concerning aspects of clinical assessment and management). The 16-cluster solution was therefore chosen as the map to be taken forward to the group interpretation stage.

There was no single precise 'tipping point' observed between increasing and decreasing theoretical coherence for the local group map, with possible inflexion points observed at the splits between both the 8 and 9, and the 11 and 12-cluster solutions. The 12-cluster solution was chosen as it was the last point before subsequent splits became arbitrary and previously coherent clusters were fragmented. It was also determined that the group could re-merge clusters in the interpretation if they believed this improved the coherence of the map. This cluster split, which appears to differentiate between patient-specific



11 cluster



12 cluster

(Cluster 1)
1. The importance of the patient's thoughts, attitudes and feelings on their pain experience
61. What the patient thinks the future holds
37. The patient's preferences about treatments
44. Any psychological barriers to treatment
64. The patient's level of motivation to engage in treatment
10. The roles and activities that are important to the patient
36. The effect of the patient's behaviour on their pain
42. The patient's skills in self-management
40. The patient's confidence in their ability to self-manage
72. The expectations of the patient about treatment

(Cluster 2)
6. Understanding the patient's beliefs about the cause of their problem
76. Acknowledgement of how the patient chooses to deal with pain
88. Adherence with treatment
9. A clinician's own influence on the patient's beliefs and behaviour towards work
27. That patients may find it difficult to accept that there are psychosocial influences on their pain
60. The attitudes and beliefs of the patient about the healthcare profession

NB: The interpretation and cluster lists detailed here reflect the original statement positions determined by the MDS. During interpretation by the group some statements were moved to clusters considered to better reflect their content. These final cluster compositions are detailed in appendix 9.

MDS = multidimensional scaling

Figure 4.3: Summary of the interpretation of the theoretical coherence of the split between 11 and 12 clusters in the local group map

psychological, or cognitive, features and the incorporation of these within the clinical approach, is illustrated in figure 4.3; which also serves to illustrate the process by which the coherence of successive cluster splits were examined.

4.7.4 The interpretation of the maps

4.7.4.1 International group interpretation

Three of the original statement generation workshop attendees participated in the interpretive workshop; a nurse, a chiropractor and a physiotherapist. To ensure the most effective use of time and to minimise any potential barriers to communication inherent in the teleconferencing medium, participants had been invited to share their initial thoughts about the map before the session.

The final, interpreted map is illustrated in figure 4.4 and the median importance rating of the included statements for each cluster is detailed in table 4.3. The map includes the final labels assigned to each of the clusters and highlights (with red circles) the statements that were moved to a different cluster. For example, item 63 "*a patient's perception of their future ability to work*" was moved from cluster 1 ('beliefs') to cluster 5 ('work beliefs') and a number of items, including item 49 *"the impact of a patient's pain problem on their social relationships, including family*" were moved from cluster 8 ('work') to cluster 4 ('social relationships and support'). One item, 54 (*"a clinician's awareness of their own limitations and recognition of when to discharge a patient or refer them on"*), was considered too complex by the group to be logically placed in any single cluster, and was therefore removed from the map. All the statements that were relocated in the

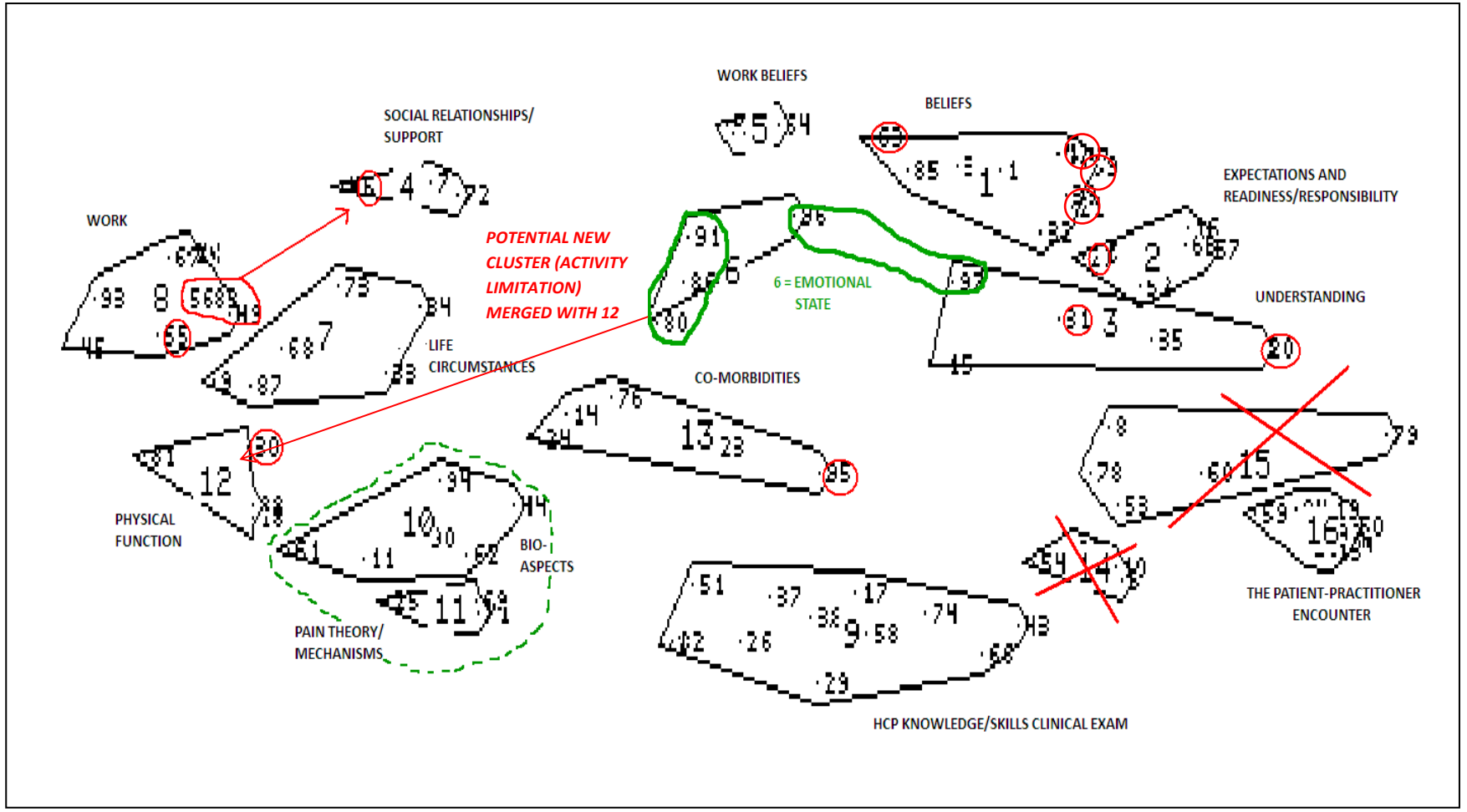


Figure 4.4: The international group cluster map including the amendments made during interpretation

Small number=statement number; large number=cluster number, red circle=relocated statement, red arrow=represents movement of several statements, red cross=dissolved cluster (all statements relocated), green demarcation=potential new cluster configuration

Table 4.3: Cluster labels and median importance rating of included statements for the international map

Cluster no.	Agreed cluster label	Median statement importance rating
1	Beliefs	4
2	Expectations and readiness/responsibility	4
3	Understanding	4
4	Social relationships/support	3
5	Work beliefs	4
6	Emotional state	3
7	Life circumstances	3
8	Work	4
9	HCP knowledge/skills, clinical exam	4
10	Bio-aspects	3
11	Pain theory/mechanisms	4
12	Physical function	3.5
13	Co-morbidities	3.5
16	The patient-practitioner encounter	4

NB. Clusters 14 and 15 dissolved

interpretation stage are highlighted in the final cluster lists. These lists detail the composition of each cluster and are included in appendix 9a.

The group initially considered merging clusters 14, 15 and 16 on the basis that they all largely concerned aspects of the 'clinical encounter'. However, as discussion evolved it was decided that the statements in clusters 14 and 15 were not sufficiently homogeneous and these clusters were ultimately dissolved as their statements were placed elsewhere. As a result, cluster 16 became the more conceptually distinct 'patient-HCP encounter'.

A new cluster ('activity limitation') was initially created by the group when they separated a collection of geographically proximal statements from cluster 6, however these statements were ultimately merged with cluster 12 ('physical function'). The group initially discussed merging clusters 10 and 11, although time did not allow this area of the map to be revisited and therefore the labels initially assigned by the group (pain theory/mechanisms and bio-aspects) were retained.

The group debated the validity of keeping 'work beliefs' and 'work' separate, rather than merging them. It was suggested that as a HCPs' understanding of a patient's work situation would usually be informed by patient report, then the constructs of work and a patient's work beliefs were largely equivocal. In addition, it was noted that as all the statements in cluster 5 were prefixed with "a patient's perception of" then it was possible that it was statement wording that had 'pulled' them across the map towards 'beliefs/expectations', rather than the statements being conceptually different from the other work-related items. Conversely, it was argued that a patient's beliefs/perceptions are, and should be, distinct from the realities of a patient's work situation and as such should be distinguished within the HCPs' assessment and management and this was the view agreed by the group.

A final recurring issue within the group's discussion was the potential tension in the map between the theoretical and the practical application of a biopsychosocial approach. For example, although the content of cluster 9 was identified as indicative of 'HCP knowledge/skills and the clinical exam', it was suggested that there was a distinction between the theoretical and performance aspects of this and as such, some items could be moved to cluster 16. However, cluster 9 was not revisited in the discussion so ultimately these items were not relocated.

4.7.4.2 Local group interpretation

Ten of the 14 local group participants attended the follow-up interpretation workshop. The final, interpreted map is illustrated in figure 4.5 and the median importance rating of the included statements for each cluster is detailed in table 4.4. Statements that were

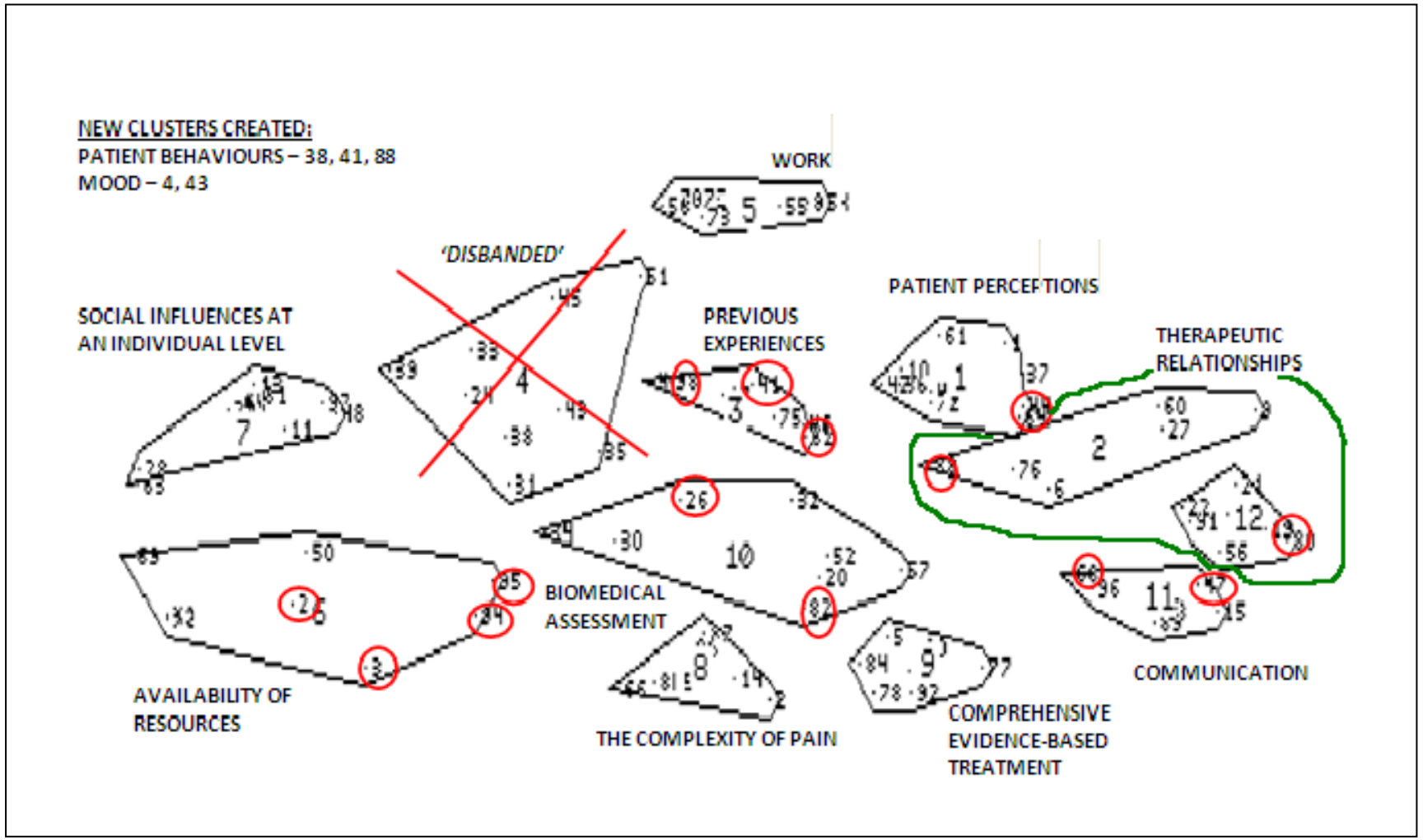


Figure 4.5: The local group cluster map including the amendments made during interpretation

Small number=statement number; large number=cluster number, red circle=relocated statement, red cross=dissolved cluster (all statements relocated), green demarcation=new cluster configuration

Table 4.4: Cluster labels and median importance rating of included statements for the local group map

Cluster no.	Agreed cluster label	Median statement importance rating
1	Patient perceptions	4
2	Therapeutic relationship	4
3	Previous experiences	4
5	Work	4
6	Availability of resources	3
7	Social influences at an individual level	3
8	The complexity of pain	3
9	Comprehensive evidence-based treatment	4
10	Biomedical assessment	3
11	Communication	4
12	*Incorporated into cluster 2 (therapeutic relationship)*	-
New cluster	Patient behaviours	4
New cluster	Mood	4

moved to a different cluster are again indicated with red circles and highlighted in the final cluster lists included in appendix 9b.

The demarcation of cluster 2 and 12 in green illustrates that the statements in these clusters were considered conceptually indistinguishable by the group, which opted to merge the two into a large cluster labelled 'therapeutic relationships'. Cluster 4 was noted as being quite dispersed, both geographically and conceptually, with statements being 'pulled' towards a number of different areas of the map including clusters 10 and 7 ('biomedical assessment' and 'social influences at an individual level' respectively). This cluster was ultimately dissolved as all the statements were relocated to clusters with which they were considered to be better suited.

Two new clusters, 'patient behaviours' and 'mood', were created from statements removed from other clusters and which were not able to be placed in existing clusters. A single item, 98 (*"sleep deprivation"*), originally from cluster 3 remained unplaced in the map however the group believed it was an important component and should not be removed.

There was considerable discussion concerning the most appropriate label for cluster 9, which included debate about the nature of evidence-based and holistic practice, with the group agreeing that they were different (and potentially theoretically distinct) concepts and that neither presumed the other. However, the group concluded that this cluster did represent issues of 'best practice' and comprehensive management and therefore (after some statements were removed) it was labelled 'comprehensive evidence-based treatment'. This discussion highlighted the influence that statement wording may have on the way in which they are sorted, especially where the meaning of a word or expression may not be universally agreed.

The discussion around cluster 6 provided an example of the nature of a cluster becoming clear as the group interpretation progressed. The group initially identified two elements within the cluster, 'resources for well-being' and 'engagement with self-care.' The term 'health literacy' was discussed as a potential label, but again it was decided that the precise meaning and scope for this term was not universally agreed. However, as discussion continued and a number of the items were relocated to other clusters, the group agreed that the nature of this cluster had become clearer and now primarily concerned the availability of resources, rather than an individual's ability to navigate them.

A final area of the map to inspire lengthy discussion was cluster 3, where the nature of co-morbidities and concepts potentially missing from the map were debated. It was decided that it was unclear whether statements such as "*The emotional state of the patient"* (statement 4) referred to psychological issues as barriers to treatment or as co-morbidities. A co-morbidity cluster was considered, but ultimately other statements that might have

populated it were considered to be better placed elsewhere and this cluster emerged as concerning a patient's previous experiences as a number of items were removed.

4.7.5 Development of the overall conceptual framework

As described in methods section 4.6.7, the final interpreted maps were combined thematically adhering to a number of a priori criteria. Six primary domains (broad areas of conceptual similarity) were identified as being common to both maps and were used as the initial units for synthesis. The six primary domains and the clusters corresponding to each of these in both maps are detailed in table 4.5.

Table 4.5: The six primary domains of the framework and their contributory clusters

Primary domains	**International group clusters** Name (cluster number)	**Local group clusters** Name (cluster number)
Individual	Beliefs (1) Expectations (2) Understanding (3)	Patient perceptions (1) Patient behaviours (new) Previous experiences (3)
Social	Social relationships/support (4) Life circumstances (7)	Social influences at an individual level (7) Availability of resources (6)
Work	Work beliefs (5) Work (8)	Work (5)
Emotions	Emotional state ('new' 6)	Mood (new)
Bio-clinical	HCP knowledge/skills, clinical exam (9) Bio-aspects (10) Pain theory/mechanisms (11) Physical function (12) Co-morbidities (13)	The complexity of pain (8) Comprehensive evidence-based practice (9) Biomedical assessment (10)
Therapeutic relationship	The patient-practitioner encounter (16)	Therapeutic relationship (2,12) Communication (11)

These six primary domains were retained in the overall framework, although with the exception of 'emotions' all the domains include a number of secondary and tertiary domains. The credibility of 'emotions' as a distinct and separate domain outwith 'individual patient-related factors' was discussed, and it was decided that as the local group had

argued strongly for it to remain separate in their conceptualisation then it should also remain separate in the overall framework.

By way of example, using the primary domain of 'work', a series of tables (4.6 a, b and c) illustrate the process of merging of the cluster maps. Table 4.6a is the initial statement list for the clusters identified as being most closely aligned with the domain. Table 4.6b illustrates the themes identified within this domain by a single investigator, the statements which contributed to the theme and the statement(s) which they elected to represent the theme. Finally, table 4.6c displays the complete and final synthesis of the 'work' domain incorporating the independent synthesis of all three investigators.

The complete synthesis for all six primary domains is included in appendix 10, however the domains of the overall framework are detailed in table 4.7. This table includes the number of statements in each primary domain and their median importance rating. Appendix 10 also details the 8 statements which were identified as being better placed in a different domain and were therefore moved and the 16 statements which were unplaced in the overall framework.

Table 4.6a: Cluster lists for the primary domain of work

International group		Local group	
Cluster(s)	**Statements**	**Cluster(s)**	**Statements**
5 Work beliefs	g47 - A patient's perception of the link between their job and their symptoms g48 - A patient's perception of their ability to continue in work g64 - A patient's perception of the physical demands of their job g63/1 - A patient's perception of their future ability to work	**5 Work**	r7 - The patient's work situation r54 - The impact of the patient's work on their problem r59 - The demands of the patient's work r58 - The attitudes and beliefs of the patient's employer r70 - Support from the patient's employer r73 - Whether the patient is off work because of their pain problem r8 - The patient's perceptions of the impact of their work on their problem r53 - The patient's attitude toward work r74 - Whether the patient expects to get back to work r79 - A patient's perceived barriers to work r55 - Early return to work
8 Work	g12 - A patient's workplace environment g75 - Barriers to return to work g67 - A patient's relationship with co-workers or supervisors g45 - The effects of the pain on work and work on pain g93 - A patient's job g46/4 - The impact of a patient's pain problem on their ability to remain in/return to work		

Notes: g=local group statement; r=international group statement

Table 4.6b: Themes identified, contributory statements and suggested representative statement (Investigator 1)

Identified theme	Contributory statements informing identification of theme in each map	Chosen representative statement
(Patient's perception of) the link between their job and their symptoms	g47 - A patient's perception of the link between their job and their symptoms r8 - The patient's perceptions of the impact of their work on their problem	g47 - A patient's perception of the link between their job and their symptoms
(Patient's perception of) future ability to work	r74 - Whether the patient expects to get back to work g48 - A patient's perception of their ability to continue in work g63/1 - A patient's perception of their future ability to work	g63/1 - A patient's perception of their future ability to work
Relationships/support at work	r58 - The attitudes and beliefs of the patient's employer r70 - Support from the patient's employer g67 - A patient's relationship with co-workers or supervisors	g67 - A patient's relationship with co-workers or supervisors

Notes: g=local group statement; r=international group statement

Table 4.6c: Complete synthesis of the primary domain of work, incorporating the analysis of all three investigators

Primary domain	Secondary domain	Tertiary domain
Work	Individual's perceptions about work	Ability to continue/return to work
		Impact (of work) on their pain
	Individual's work situation	Characteristics of the job
		Impact of the pain problem on work
		Relationships at work

Table 4.7 Overall conceptual framework for biopsychosocial clinical orientation (domains only)

PRIMARY DOMAINS No. of items in domain (median importance rating)	SECONDARY DOMAINS	TERTIARY DOMAINS (where applicable)
Bio-clinical	Patient presentation	Patho-anatomy
		Co-morbidity
47 (4)		Pain and physical function
	Assessment and management	Examination and appropriate use of tests/imaging
5* items		**Exclusion of serious pathology ****
		Importance of bio, psycho and social elements **
		Self-management and secondary prevention
		Pathways of care
	Clinician understanding of pain mechanisms	Multi-factorial nature of pain
		Pain theory
		Limits of the biomedical approach
	Evidence-based practice and training	Evidence-based practice
		Biopsychosocial skills and training *
Individual patient factors	**Beliefs and expectations ***	
	Previous experiences	
	Understanding	
37 (4)	Treatment preferences and goals	
2* items	Coping and behaviour	
	Motivation/readiness *	
Therapeutic relationship	Patient engagement	
	Communication, listening and language **	
36 (4)	**Patient information needs ***	
7* items	**Shared understanding and responsibility**	**Eliciting and understanding patients' beliefs ***
		Agreement about (purpose of) treatment
		Goal setting **
	Patient-practitioner relationship *	
	Practitioner influences	

Social **31 (3)**	Social relationships and support	Social support
		Relationship between a patient's pain problem and their social relationships
		Legitimacy
	Religion, culture, ethnicity	
	Physical environment	
	Resources	Access to/availability of health services
		Community facilities
	Socio-economic context	
	Participation	
Work **19 (4)**	Perceptions about work	Beliefs about their work and ability to continue/return to work
		Beliefs about the impact of work on their pain
	Work situation	Characteristics of the job
		Impact of the pain problem on work
		Relationships at work
Emotions **5 (3)**		

Notes: *=statement rated as 5 (extremely important); secondary/tertiary domains in bold=contain one or more *item (extremely important)

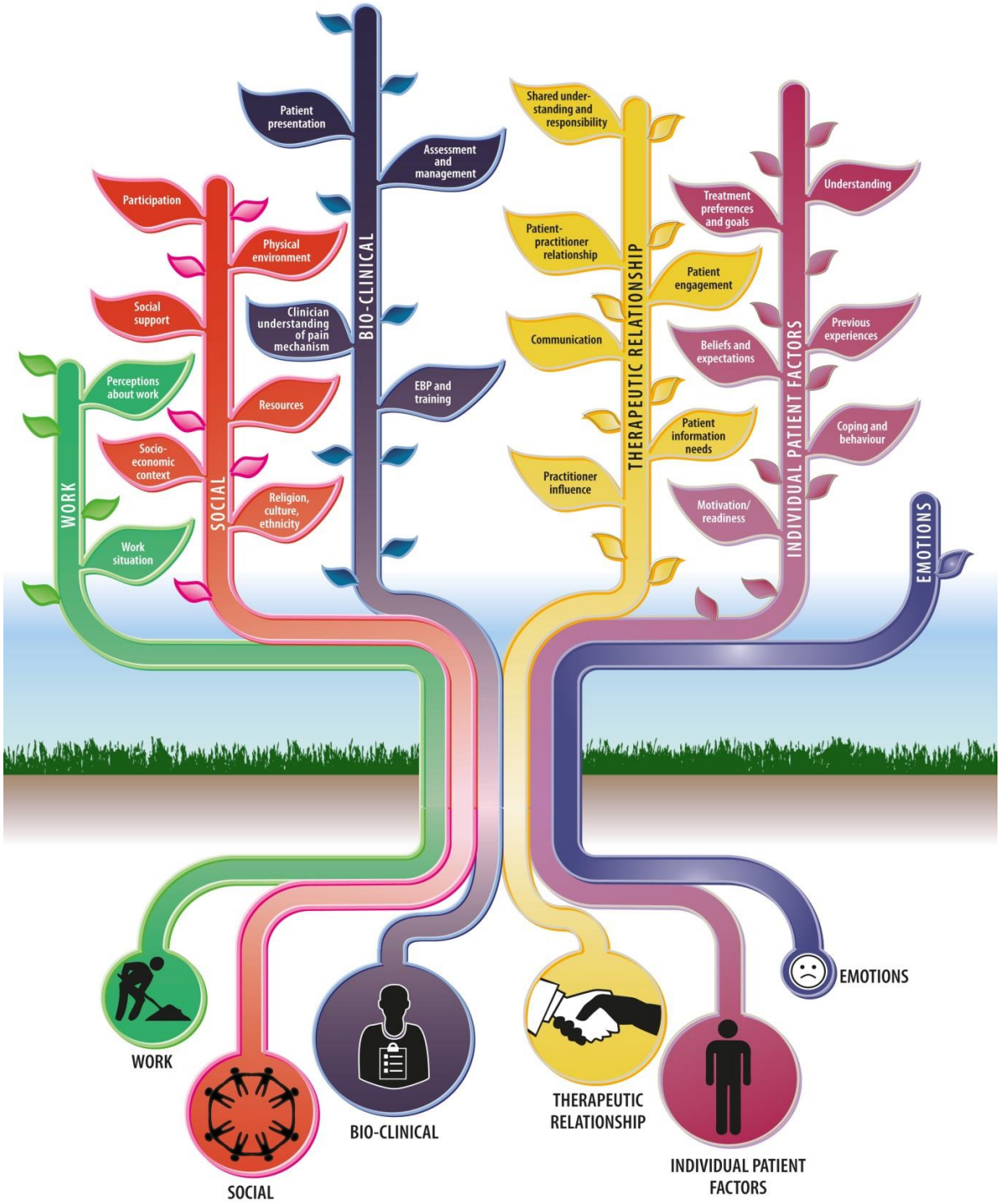


Figure 4.6: Infographic of the conceptual framework for biopsychosocial clinical orientation

(Primary and secondary domains only)

The overall framework is also depicted as an infographic in figure 4.6. The infographic was developed to provide a visual representation of the framework, in particular to support dissemination activities. The 'tree' format was chosen to allow each primary domain to be represented by a separate 'branch', the height of which reflects the domain's median statement importance. The associated secondary domains are depicted as leaves. The diameter of the node from which each branch originates reflects the size of the primary domain in terms of the number of original concept mapping statements it comprises.

4.8 Discussion

The aim of this concept mapping process was to develop a comprehensive and robust conceptual framework for the biopsychosocial clinical approach to common MSK pain to inform the scale development process. Two separate concept mapping processes were conducted with separate local and international groups, including 40 experienced MSK clinicians and researchers. There was considerable conceptual similarity between the maps produced by the two groups which assisted the synthesis of the two into the overall conceptual framework detailed in table 4.7 and illustrated in figure 4.6. The key findings and the strengths and limitations of this study are discussed in the sections below, followed by consideration of both the clinical and research implications of the findings, including how they will inform the next stage of this scale development process.

4.8.1 Summary of key findings

The conceptual framework for the biopsychosocial clinical approach developed in this study comprised six primary domains, namely: 'bio-clinical', 'individual patient factors', 'therapeutic relationship', 'social', 'work', and 'emotions'. All but one of the primary domains contained a number of secondary and tertiary domains which were illustrated in

table 4.7 and figure 4.6. The complete conceptual framework is included in appendix 10. Three key findings of particular note in this framework, which will be discussed in turn below are: 1) The strength and distinct nature of the representation of biological and social elements of the clinical approach, 2) the absence of a similarly discrete psychological domain and 3) the emergence of the relational component within the approach, in the form of the 'therapeutic relationship' domain.

4.8.1.1 Representation of biological and social elements within the framework

One of the most striking outcomes from this conceptualisation process was the substantial representation afforded to biological and social elements of the clinical approach to MSK pain. Commentators in various areas of MSK practice and research have previously suggested that attempts to implement the biopsychosocial model in clinical practice to date have been unbalanced, with a disproportionate emphasis on psychological influences on pain and disability (Hancock & Maher 2011). It has been argued that this has been to the exclusion, or under-representation of both biological (Weiner, 2008) and social (Pincus et al. 2013; Killick & Davenport 2014) elements.

However, in addition to being the largest primary domain in the framework, the bio-clinical domain generated by the participants in this study includes many of the established elements of MSK clinical practice which some believe have become neglected within the biopsychosocial approach (Hancock & Maher 2011). For example, the patho-anatomical features of the MSK presentation, the patient's physical function and screening for serious pathology were included in the secondary domains 'patient presentation' and 'assessment and management' of the bio-clinical domain. These components are considered cornerstones of MSK clinical assessment by all MSK healthcare professions (Petty 2013;

Magee 2014). Furthermore, the identification of serious pathology was considered to be of the utmost importance by participants as it was one of just two tertiary domains in the framework to be exclusively composed of statements with a median rating of 'extremely important'.

However, also included in the bio-clinical domain are statements which demonstrate understanding of MSK pain as a multi-factorial entity, and firmly embed the biological components within the biopsychosocial paradigm. For example, both the appropriate use of tests and imaging and the importance of including biological, psychological and social factors in assessment are included in the 'clinical assessment and management' secondary domain. These statements serve to contextualise the 'bio' element and provide a clear distinction between the nature and interpretation of biological components within a biopsychosocial approach, and those within the dualistic, biomedical paradigm. This is clearly demonstrated in the secondary domain 'knowledge/understanding of pain mechanisms' which contained the tertiary domains 'multi-factorial nature of pain' and 'limits of the biomedical approach'. Statements within these domains included: *"That the specific cause of pain is not always understood"* (r83), *"the fact that pain can be centrally generated and maintained"* (g70) and *"that diagnostic imaging is not always relevant"* (g74).

In terms of the representation of social factors within the framework, both the local and international groups differentiated between statements concerning work and employment, and more expansive social concepts such as religion, culture or ethnicity and socio-economic context. As noted previously, although the work domain contained fewer statements, these were considered to be of greater importance within the clinical approach

than those concerning wider social issues, although a larger number of statements were included in the latter domain. One potential explanation for this is the significant focus within the biopsychosocial MSK literature on work and occupational issues, especially in relation to secondary prevention and the reduction of work-related disability (Loisel et al. 2005; Main et al. 2008). In contrast, although an individual's social networks and relationships are acknowledged as influential in an individual's pain problem and its impact (Cano and Leong 2012, in Hasenbring et al. 2012), it has been suggested that social factors beyond the level of the individual are perhaps the most neglected influence on MSK pain and disability (Pincus et al. 2013; Shaw et al. 2013). These influences include socio-economic conventions and infrastructure such as welfare provision, inequality or access to resources (Soklaridis et al. 2010; Phillips et al. 2008). It may be that greater familiarity with key work-related concepts also allowed participants to articulate these more succinctly, while still considering them of high importance and that a lower level of shared understanding of pertinent wider social constructs led to a greater number of constructs being used to represent this domain. Additionally, wider social influences are arguably more diverse and complex than the context-specific domain of work, and therefore a greater number of statements are required to describe them.

When merging the maps from the two group processes, the distinction between work and work beliefs made by the international group was retained. In their interpretation session, this group had observed that constituent statements in the 'work beliefs' cluster (cluster 5) were prefixed with *"the patient's perception of …."*, or a similar configuration, and were positioned closer to other 'belief' statements (cluster 1) than the 'work' cluster (cluster 8). This potentially demonstrates the influence of statement wording, as well as content, on

the way in which they were sorted by participants. However, this group also argued that a patient's perception of their work and its relationship with their pain was distinct from potentially more objective features of their work and should therefore remain separate. This group also decided that beliefs about work were sufficiently different to more general pain beliefs, and they therefore also remained distinct from the more general pain beliefs cluster.

These distinctions mirror those made in the updated 'flag' framework (originally developed by Kendall et al. (1997)), where occupational risk factors were reassigned from 'yellow flags' (which became normal, but unhelpful, psychological reactions to MSK pain) (Main and Burton 2000 in Main & Spanswick 2000), to 'blue' and 'black flags'. In this extended classification, the former represents a patient's perception that their workplace is stressful, unsupportive, and excessively demanding and the latter concerns the more observable characteristics of the workplace and nature of the work, including any insurance or compensation system under which workplace injuries are managed (Kendall et al. 2009).

While the lower median importance rating of statements within the 'social' domain may be due to the lower level of exposure afforded to wider social factors in the literature, in comparison to the more specific context of work, it may also reflect the ambivalence about the role and importance of social context within MSK clinical practice observed in studies of HCPs. For example, in a study of the recognition and use of the biopsychosocial pain management model by HCPs working in multidisciplinary pain clinics in the UK, Harding et al (2010) found that despite a stated commitment to the model, management strategies focused on the psychological, and that social aspects of chronic pain were notably absent from participants' accounts. It is possible that HCPs, particularly the expert groups who

participated in this study, have become more confident about addressing work-related issues within their thinking and management of patients with MSK pain, whereas they remain uncertain about the way in which an awareness of wider social influences might be incorporated. This may be, in no small part, due to a perception that discussing a patient's work situation is quite acceptable, whereas broaching more personal social aspects, such as relationships or financial difficulties may represent less appropriate territory for enquiry and support within the HCP-patient relationship (Synnott et al. 2015). However, it must be acknowledged that studies have found HCPs to also be reluctant to address more specific work-related issues, perceiving that these lie outside their professional remit (Gray & Howe 2013; Wynne-Jones et al. 2014). It is therefore possible that the relative importance afforded to social elements in this study is a reflection of the participants' expertise and knowledge of the literature, compared with that of the wider clinical community.

4.8.1.3 Differential representation of psychological elements within the framework

Given the pervasiveness of psychological constructs in the biopsychosocial MSK pain literature to date, and the clear delineation of bio-clinical and social factors within the resultant framework, it is noteworthy that a singularly distinct psychological domain did not emerge in the same way. Both the international and local group maps included an area dominated by psychological constructs. These were identified as clusters 1, 2 and 3 in the local group map and 1, 2, 3, 5, and 6 in that developed by the international group (see figures 4.4 and 4.5). These clusters included several of the psychological factors most frequently associated with MSK pain including: a patient's beliefs, expectations and preferences (Foster 2007; Main, Foster, et al. 2010), their behaviour (Fordyce 1976; Crombez et al. 2012) and motivation (Jensen et al. 2003). However, these clusters also

included other patient-related constructs, such as lifestyle and previous pain and treatment experiences and, as a result, became the more general primary domain 'individual factors'.

A further difference in the way that psychological constructs were conceptualised and managed by the two groups was that they also featured prominently in the 'therapeutic relationship' domain; where they infused a number of practitioner-related statements in a way that was not observed with bio-clinical and social constructs. For example: "*understanding the patient's beliefs about the cause of their problem"* (r6) and *"acknowledgement of how the patient chooses to deal with pain"* (r76). It may be that the familiarity of well-established psychological constructs allowed participants to operationalise them in this more nuanced manner. It would also be understandable if the representation of psychological constructs within the framework was consciously constrained by participants who, aware of the argument that there may have been a disproportionate emphasis on psychological factors in the management of psychological factors in recent years, sought to offer a more balanced conceptualisation of the biopsychosocial clinical approach. Although not vocalised by either group, such an attempt to 're-balance' the approach may have also been informed by the understanding of these expert groups that many trials of psychological interventions for common MSK pain have demonstrated only modest treatment effects and limited impact on resultant disability to date (Eccleston et al. 2013; van der Windt et al. 2008). It is also possible that the self-presentational concerns within the peer-group process (Wooten & Reed 2000) encouraged participants to more readily include more 'modish' elements of the biopsychosocial model and that an emphasis on, or distinction of, psychological factors might either have been considered passé, or that they 'go without saying'. However psychological constructs were

still judged by the participants to be important within the approach, with four of the 14 statements with the highest median rating of 'extremely important' including a psychological element.

As described in section 4.7.5, 'emotions' was retained as a distinct domain when generating the overall conceptual framework, due to the strength of argument in the local group that these statements were not readily combined with those in any other cluster. This decision rendered the domain by far the smallest in the map, containing just two principal constructs: a patient's emotional state and the impact of co-existing anxiety and depression. As emotions are recognised as a psychological construct (Linton & Shaw, 2011), it is somewhat surprising that these statements were not incorporated into the 'individual patient factors' domain, in which many other psychologically-oriented statements were positioned. In the local group discussion, it was briefly mooted that emotions might also be considered a co-morbidity, and could therefore be included within this sub-domain of the 'bio-clinical' domain. However, this suggestion did not gain sufficient support within the group.

The 'emotions' primary domain was also one of the two in the framework to achieve the lower median importance rating of three ('quite important') the other being the aforementioned 'social' domain. This finding is consistent with the suggestion that the role of emotions in MSK pain is currently under-researched and under-represented in the literature (Main 2013; Turner-Cobb et al. 2015). However, it has also been stated that emotional issues, such as depression or anxiety, should be primarily managed by mental health, rather than MSK practitioners (Main & George 2011). This prevailing belief might have contributed to the tendency for participants, who were predominantly MSK clinicians,

to rate these concepts as less important, or less of a priority within the biopsychosocial clinical approach, in comparison to the other components. However, although this is undoubtedly the case where a patient's presentation is dominated by their emotional problems and addressing significant mental health issues is usually considered outwith the clinical remit of the MSK clinician, it is not always so. For example, although specialist services exist for both mental health and MSK conditions, GPs in the UK and elsewhere remain the first point of contact and primary care provider for both (Hong et al. 2013). Furthermore, many MSK clinicians may have additional training or qualifications in psychological therapies, such as cognitive behavioural therapy, which they routinely incorporate into their MSK practice, or work in services where mental health comorbidity is routinely observed such as chronic pain services or trauma (Outcalt et al. 2015; Lowe et al. 2016).

It is also worth noting that the focus statement used in this study asked participants to consider what a clinician who follows a biopsychosocial approach could consider *relevant* in common MSK pain problems. This is not the same as what they would directly and explicitly address in their clinical management. It has been argued that clinicians should be aware of the impact which factors beyond their immediate influence may have on a patient's pain presentation and their response to treatment (Shaw et al. 2013). This rationale applies equally to aspects of both the 'emotions' and 'social' domains, which attained the lower median statement importance rating of three.

4.8.1.4 The relational component of the biopsychosocial clinical approach

The emergence of the 'therapeutic relationship' domain within this framework represents a significant departure from previous descriptions of the biopsychosocial clinical approach,

which have provided more theoretical conceptualisations referencing the nature of MSK pain and the aim and time-contingency of treatment (Ostelo et al. 2003; Jones et al 2002). The key difference between this and the other five primary domains within the framework is that the content neither directly concerns the patient as subject, or the technical elements of clinical assessment or treatment. This domain, which included seven of the 14 items with a median importance rating of five (extremely important), concerns the inter-personal, communicative or relational elements of clinical practice. Furthermore, the focus of this domain is on HCPs' actions, such as listening or providing explanations, and therefore represents a significant shift from the dominance of patient-related constructs in the study of HCPs' attitudes and beliefs, or clinical orientation, identified in the scoping review described in chapter 3.

Many of the constructs included in the 'therapeutic relationship' domain are already considered pertinent within the context of healthcare relationships, including those in the field of common MSK pain (Ferreira et al. 2013; Lakke & Meerman 2016). For example, skilled and appropriate communication is considered to underpin effective clinical practice (Parry & Brown 2009), the importance of eliciting and addressing patients' beliefs and expectations within MSK pain consultations has been championed by several authors (Main, Buchbinder, et al. 2010; Parsons et al. 2007) and shared decision-making is advocated for its potential to promote patients' involvement in their healthcare and to increase adherence to treatment (Légaré et al. 2010).

Patient-centred consultation is already recognised as the natural mode of delivery for the biopsychosocial approach to MSK pain (Main & Linton 2013; Smith 2002) and the distinction between technical and relational elements of practice is not new. In the MSK

pain literature, it has been identified that patient perceptions of care quality are informed by both technical competence and subjective experience (Fadyl et al. 2011) and several authors have considered the potential in optimising the 'human technology' inherent in therapeutic relationships (Miciak et al. 2012; Kayes & Mcpherson 2012). The relational component of a therapeutic approach has been made explicit by the proponents of motivational interviewing (a psychotherapeutic counselling style) who identify both the technical skills involved in the method and the 'spirit' within which it should be conducted (Miller & Rollnick 2012). The inclusion of the therapeutic relationship domain within this conceptual framework is a clear endorsement of the importance of the relational component of the biopsychosocial clinical approach.

Therapeutic relationship also constitutes a completely unique dimension in the evaluation of HCPs attitudes and beliefs, as items concerning this relational aspect of clinical practice have not featured in any of the existing quantitative studies of HCP's attitudes and beliefs towards MSK pain and its management

The importance of appropriate skills is also emphasised in the 'communication, listening and language' secondary domain of 'therapeutic relationship'. The consideration of clinician training and competence is not unique to the 'therapeutic relationship' domain, as it also appears in the 'bio-clinical' domain. The implications of the need for adequate training, especially in the relational components of the approach, is examined later in this discussion. However, the inclusion and prominence of the relational dimension of biopsychosocial clinical practice suggests that the implementation of biopsychosocial clinical practice requires more than simply embedding technical elements of the approach within existing practice which may remain fundamentally biomedical and that a more

fundamental shift is required to develop HCPs who both employ the skills and practice within the 'spirit' of the biopsychosocial approach.

In summary, although there is a significant body of literature which considers the way in which predominantly psychological, and to a lesser extent social, factors should and can be integrated within existing MSK clinical practice (Kendall 1997; Main & George, 2011; Penney 2010), this is the first study to attempt to develop a grounded framework for the biopsychosocial clinical approach to common MSK conditions. It represents the 'state of the art' in terms of the clinical operationalisation of the biopsychosocial model for MSK pain. However, it also reflects some of the current uncertainty concerning the way in which elements of the approach which HCPs may feel fall outside their direct sphere of influence can be integrated more fully into MSK clinical practice. For example, recognising and discussing the impact that wider social factors may have on an individual's pain and disability, and while not being in a position to influence these directly, accommodate any relevant social factors within the design of treatment programmes.

4.8.2 Comparison of the concepts included in the framework and those previously used to quantify HCPs' attitudes and beliefs about MSK pain

When compared to the constructs used to quantify HCPs' attitudes and beliefs to date, as identified in the scoping review described in chapter 3, there a number of similarities and differences with those included in this new conceptual framework. Unsurprisingly, participants in this study articulated the contemporary representation of pain as a multi-factorial entity which can be centrally generated and maintained. This is in contrast to the dominance of the dualistic model of pain in the study of HCPs' attitudes and beliefs to date. Treatment and causality were also common themes in the studies included in the scoping review, neither of which were prominent in this conceptualisation. Similarly, determinants

of outcome, which have been a frequently utilised attitudinal construct in the quantification of HCPs' attitudes and beliefs, are implied rather than explicitly stated in the new framework. Wider social issues and the therapeutic relationship are entirely new constructs in the conceptualisation of HCPs attitudes and beliefs, or clinical approach.

A key finding from the scoping review was that the small number of practitioner-related constructs that featured in early studies of HCPs' attitudes and beliefs were excluded from later studies. This was associated with the use of tools adapted from patient measures and the absence of clinical stakeholder involvement in the scale development process. It might therefore have been anticipated that the expert MSK clinicians and researchers recruited to participate in this study would generate a number of practitioner-related and clinically focused constructs. Two of the primary domains included in the framework were largely practitioner-related and/or clinically focused: 'bio-clinical' and 'therapeutic relationship'.

4.8.3 Strengths and limitations of this study

As with any research process, this conceptualisation study includes a number of particular strengths and limitations which are examined below.

4.8.3.1 Strengths

This study was designed to be rigorous and transparent at each stage of the conceptualisation process so that the resultant framework could be used confidently as the basis for amending the PABS biopsychosocial scale. This confidence is informed by a number of key methodological strengths of this concept mapping study. Firstly, the participants across the two concept mapping groups represented a wide range of MSK clinical professions, from a number of different countries and working in a variety of clinical, educational and research contexts. Participants were also either working in a research

centre with an international reputation for its research in the field of MSK pain, or attendees at a leading international conference whose theme for that meeting focussed on the biopsychosocial model for common MSK pain. They can therefore, arguably, be considered to have a high level of expertise in the field.

Secondly, the number of participants recruited to both the local and international concept mapping processes met recommendations for minimum participant numbers for statement generation (Rosas & Kane 2012) and to provide a reliable statement structure in the local group (Trochim 1993). The retention of participants through the local group process was extremely high with 12 of the original 14 participants returning a statement sort and 10 participating in the final group interpretation session. Although the response rate in the statement structuring stage in the international group was lower and fell just outside that recommended, the stress value for the multidimensional scaling of both groups was within tolerable limits for concept mapping suggesting an acceptable level of consistency/reliability for both groups.

Thirdly, at each stage of the study steps were taken to minimise investigator bias. These included the use of three investigators, synchronisation of group facilitation style (through prior discussion and by the three investigators facilitating the local group workshop together, before each leading one of the three statement generation groups in the international workshop), the definition and implementation of a priori criteria for both the rationalisation of the two statement sets, selection of the most theoretically coherent cluster solutions and merging of the two separate maps to create the overall conceptual framework.

Finally, there was a good degree of concordance in the structure and content of the two maps and between the resultant framework, current literature concerning the biopsychosocial approach and established clinical practice guidelines (Main & George, 2011; Koes et al. 2010; Goertz et al. 2013). Taken in combination, these strengths provide confidence that the resultant framework is comprehensive and has applicability across a number of different health care professions, contexts and countries.

4.8.3.2 Limitations

Although the retention of participants through the local group process was excellent and sufficient to provide a reliable point map in the international group, there were only three participants who were able to take part in the final interpretation of the international group map. With such a small number of participants, it is possible that the final map might not represent the interpretation of the group as a whole. The challenges of retaining participants when conducting studies using electronic methods has been acknowledged (Petrucci & Quinlan 2007). However, the three participants who undertook the group interpretation were still a diverse group, representing three different healthcare professions and three different countries. It is therefore likely that a sufficiently diverse range of opinions were incorporated in the interpretation; a position which is supported by the concordance observed with the map produced by the local group. The investigators also observed that the quality and richness of the discussion that was achieved with the three participants was perhaps greater than that which would have been possible if conducting the teleconference with a larger number of participants.

Due to the finite amount of time available for the initial statement generation workshops (90 minutes), not all the statements generated by the participants were discussed and

clarified by the group. The pragmatic decision was taken that rather than lose the data from the process, participants were invited to submit any statements that they had been unable to present to the group in writing. This resulted in large sets of statements being submitted from both groups, not all of which had undergone group clarification. As the number of statements that could be taken into the structuring stage of the process was limited to 99 by the Concept Systems software, this meant that a considerable number of statements were rationalised by the investigators. It is possible that participants might have found it harder to sort statements that hadn't been discussed by the group. It is not possible to discern what difference this might have made to the resultant maps; however, the statement rationalisation processes were conducted with a number of criteria which aimed to retain as much as the original content of the statements as possible and each group had the opportunity to discuss the statements in the final interpretation of the map.

Finally, as is the case with any group conceptualisation or consensus process the output is the product of a particular collection of participants at a particular point in time, and it is possible therefore that a different result may be obtained with a different group, or at a different time (Rosas & Ridings 2016; Murphy et al. 1998). The effect that group composition - in terms of profession, demographics or other characteristics - might have had on the statements and concept maps produced cannot be known. However again, the consistency in the content of the maps from the two separate groups provides confidence that the output from neither group was particularly anomalous. It is also inherent in the method that the statements generated by the group are inspired by the focus statement, and may therefore have been different if this had had a different emphasis.

This conceptual framework therefore provides a 'snap shot' of the conceptualisation of the biopsychosocial clinical approach to MSK pain, as perceived by a group of experienced MSK clinicians and researchers in 2012. It provides a distillation of current thinking about the way in which this approach should be operationalised.

4.8.4 Clinical and research implications

This study has produced a contemporary and comprehensive, yet succinct distillation of the biopsychosocial clinical orientation to common MSK pain. Although this has been developed as part of a scale development process, this framework itself also has a number of research and clinical implications beyond this immediate function.

4.8.4.1 Clinical implications

Having been developed with HCPs from a range of clinical professions and countries, and its concordance with much of the extant MSK literature, the framework developed in this study is likely to have applicability to a number of clinical functions and contexts. These might include the development and evaluation of biopsychosocially oriented MSK clinicians, practice and training programmes. The identification of the six distinct domains within the framework lends itself to the development of clinical competencies, which would allow educators, clinicians and researchers to identify specific areas of strength or weakness, identify training needs and evaluate the effectiveness of training within the target practice domain.

This new conceptual framework provides clarity for HCPs uncertain about the scope of biopsychosocial practice and the factors which should be considered within the approach. This study has confirmed the place, nature and importance of biological and social considerations within the MSK clinical orientation, and has met the need for a framework

on which to 'hang' biopsychosocial practice identified by others (Foster & Delitto, 2011). With its overtly clinical focus and the identification of the relational component, the framework also provides considerable guidance about the practical operationalisation of the biopsychosocial clinical approach for MSK pain.

This study provides a timely reminder to those within the clinical professions who still practise in a biomedical paradigm, and the need for all HCPs to fully engage in a change of culture in the management of patients with common MSK pain in our clinical populations. Such a change in culture inevitably involves training, and two areas within the framework appear to have been prioritised in this regard: clinician pain knowledge and the relational components of practice. The recognition that clinicians need a contemporary understanding of MSK pain mechanisms is highly concordant with the recent concern expressed that the level of pain teaching in HCP training programmes is inadequate (Foster & Delitto 2011; Hoeger-Bement & Sluka 2015; Doorenbos et al. 2013). These authors have reported that pain science is not explicitly included in many curricula and the prevailing paradigm underpinning qualifying education programmes remains firmly biomedical.

However, the clinical professions cannot complete the cultural change in a social vacuum. Patient expectations are a frequently cited reason for clinicians continued recourse to the biomedical approach. This manifests in HCPs referring patients for unnecessary investigations or endorsing work absence to avoid conflict and preserve the patient-practitioner relationship (Shers et al. 2001; Chew-Graham & May 1999; Watson et al. 2008). It is therefore imperative that there are continued efforts to address societal beliefs and expectations about the management of common MSK pain, to enable HCPs to provide healthcare in the biopsychosocial paradigm.

4.8.4.2 Research implications

In chapter 2 the limitations and weaknesses of the current PABS were discussed. Particular issues were lack of rigorous conceptualisation and the limitations of the biopsychosocial scale. This new framework developed in this study provides the platform for the onward development of a new biopsychosocial scale for the PABS-MSK.

One limitation of current biopsychosocial research is that interventions in trials have rarely integrated all three components i.e. biological, psychological and social, leading to the conclusion that biopsychosocial approaches have not been fully assessed (Pincus et al. 2013). The current comprehensive framework, consisting of primary, secondary and tertiary domains, could allow researchers to carefully consider and investigate the most influential components in terms of determining HCPs' clinical behaviour, effect on patients and ultimately treatment outcomes.

The biopsychosocial model of LBP has become the dominant model for developing and testing many biopsychosocial interventions (Pincus et al. 2013). One problem with this condition or site-specific approach to developing interventions is the degree to which these interventions are generalisable to other MSK conditions. A second consideration is whether this condition specific approach has led HCPs to the view that they are delivering a biopsychosocial intervention, which they might adopt for some MSK pain conditions and not others, rather than perceiving the biopsychosocial approach as an underpinning clinical orientation which guides all their practice. The comprehensive framework for all common MSK conditions developed in this study, could facilitate researchers to widen their studies of the biopsychosocial approach.

4.9 Conclusions

This chapter presented the findings of a concept mapping study and outlined a comprehensive conceptual framework for the biopsychosocial clinical approach. The framework comprised of six primary domains: 'Bio-clinical', 'individual patient factors', 'therapeutic relationship', 'social', 'work', and 'emotions'. Strong and distinct bio-clinical, social and relational elements were particularly evident in the framework. Although psychological elements were rated as important they did not emerge as a distinct domain, but were incorporated within the "individual", "work" and "emotions" domains indicating that psychological elements were considered to be important in context. The framework provides clinicians, educators and researchers with a framework to explore and develop clinical competencies, educational curricula and further investigate biopsychosocial clinical orientation.

The next chapter details the process used to generate a pool of candidate biopsychosocial items for the generic biopsychosocial scale.

Chapter 5: Generation of a pool of new biopsychosocial items and adaptation of existing items for use in a generic version of the Pain Attitudes and Beliefs Scale

Chapter 5: Generation of a pool of items for the biopsychosocial subscale of the Pain Attitudes and Beliefs Scale

5.1 Chapter introduction

This chapter explains the process of generating candidate items for the new PABS-MSK prior to their inclusion in the survey of HCPs described in the next chapter. This third stage of the scale development process describes the development of an extended pool of items using firstly, the conceptual framework derived from the concept mapping process in chapter 4 and secondly, existing PABS items adapted for use as generic MSK items. Appendices 11 and 12 contain the supporting materials which are referenced within this chapter.

5.2 Aim and objectives

The aim of this stage was to generate items for the PABS-MSK. The specific objectives developed to meet this aim were:

1. To identify the most appropriate statements from the conceptual framework for development into candidate items for a new biopsychosocial scale
2. To develop items from these statements and subject them to expert review
3. To adapt existing PABS items for use with generic MSK conditions

5.3 General principles of item generation

The psychometric properties of a measurement scale are dependent on its items, which must possess a number of qualities to allow the scale to function adequately (De Vaus, 2002; De Vet et al. 2011). Candidate items in a scale development process must therefore be developed with the potential to be: unambiguous, representative, valid, reliable, discriminatory, and have a high completion rate (DeVellis 2012; Streiner et al. 2015). The definition and implication of each of these qualities is summarised in box 5.1.

Unambiguous – items should be brief, simple, clear and easy to read for the target population and avoid jargon; increases the willingness of respondents to respond.

Representative – the item should be consistent with the construct in all respects, including response formats and instructions.

Valid – the item truly contributes to the assessment of the construct under consideration; there should be sufficient items to tap the construct.

Reliable – the item performs in consistent, predictable ways; the score produced should not change unless there is a change in the variable being assessed by the item. Ambiguous, vague or difficult questions can lead to unreliable responses.

Discrimination – the item is able to detect a specific trait of the construct being assessed; need variation in the sample. Low variance can stem from poor questions, or limited response options.

Completion rate - poor completion may indicate a problematic item and may stem from it being ambiguous or covering issues that people are unwilling to answer.

(Netemeyer et al. 2003; DeVellis 2012; Streiner et al.

Box 5.1: Definition of item qualities

One of the particular benefits of using concept mapping to develop the conceptual framework for this study is that the initial statements generated by the group participants already exhibit many of the qualities desirable in scale items (Osborne et al. 2007). The required format for the concept mapping statements was that they were uni-conceptual and worded simply, with no 'jargon'. Their meaning was also clarified and confirmed by the group, and in the final interpretation stage, the concept mapping groups confirmed that the included statements were relevant and pertinent to the conceptualisation, thus ensuring that all the statements were valid, relevant and were understood by all the HCPs participating in the concept mapping process.

It is also important that candidate items are developed which address the concept of interest; with attitude, belief, knowledge and behaviour being related, but distinct concepts (De Vaus 2002). It was observed in chapter 3, that there has been a lack of clarity as regards the development and identification of the items used to measure and investigate

HCPS' attitudes, with for example, the same item being labelled as an attitude in one study and knowledge in a different study. As this thesis concerns the development of a measure of HCPs' attitudes and beliefs, candidate items should attempt to discern either the extent to which a respondent considers an item to be true (belief) or desirable (attitude). As knowledge is not a target in this study, the ability to determine or evaluate the factual exactitude of item responses was not a consideration.

5.4 The development of candidate biopsychosocial scale items

5.4.1 Item selection

5.4.1.1 Theoretical and practical considerations

The key principle in the development of an initial item pool is that all relevant content is sampled to ensure that all the identified domains in the framework are represented in the item pool (Rosas & Camphausen 2007). It is generally accepted that an initial item pool should be over-inclusive, rather than under-inclusive as subsequent psychometric analyses will identify weak, unrelated or redundant items that should be dropped from the emerging scale in order to arrive at the strongest possible scale (Clark & Watson 1995). Although there are no definitive rules with regard the number of items which should be included in an initial item pool, a general principle is that a large pool of items is recommended (Netemeyer et al. 2003) However, there are a number of competing issues which need to be considered when deciding how many items to include.

The analytic methods utilised in the subsequent psychometric evaluation ultimately dictates the sample size required in any scale development process. Factor analysis requires a certain number of responses per item to return a stable and reliable factor structure (Field 2009) and the most recent recommendations suggest a 7:1 ratio of

responses to items (Terwee et al. 2007). Therefore, in order to test more items, more responses are required. Although a clear association between questionnaire length and response rate has not been established (Bolt, van der Heide, & Onwuteaka-Philipsen, 2014; Cottrell et al. 2015), lack of time is often cited as a barrier to participation in survey research by HCPs (Klabunde et al. 2012; Cunningham et al. 2015) and it would therefore be understandable if clinicians found it more difficult to respond to a longer, rather than a shorter instrument (Netemeyer et al. 2003). There is therefore a balance to be struck between the length of the questionnaire, the likelihood that HCPs will complete and return it, and the costs involved in increasing sample sizes. DeVellis (2012) suggests the pragmatic solution of including three to four times the number of items in the pool than are anticipated to be included in the final scale, which was the general principle applied to this study.

5.4.1.2 Identification of appropriate concept mapping statements for item development

The conceptual framework presented in section 4.7.5 incorporated the 195 concept mapping statements which had been sorted and rated by the participants in the local (98 statements) and international (97 statements) concept mapping groups. As part of the thematic analysis and map synthesis process described in sections 4.6.7 (methods) and 4.7.2 (results), each of the three investigators (KD, AB and NF) independently selected statements which they felt represented the themes they had identified. The purpose of selecting representative statements was both to characterise the theme and identify statements with the potential for development into candidate items for the new biopsychosocial clinical orientation scale. The criteria for a statement to be considered representative were as follows:

- The statement contained a concept that appeared in both contributory maps
- The statement was uni-conceptual, clear and directly represented the theme in question
- The statement was considered pertinent to all MSK clinical contexts

The statements selected by each of the investigators as representative were then used to identify those considered to have greatest potential for development into candidate scale items. To be included in the pool of candidate items, representative statements had to:

- Have been independently identified as representative by at least two of the three investigators
- Have been assigned a 'high' average importance rating by their group of origin (4 or greater). This criterion was used in a previous scale development study which derived items from a concept mapping process (Wallace et al. 2013)

In their review of the use of concept mapping in measure development and evaluation, Rosas and Ridings (2016) describe the variation in the way in which scale developers have used the concept mapping process to inform instrument construction, with only a few studies converting all statements into candidate items. However in studies where statement ratings were used in the selection of potential items, simple criteria were described such as average rating above a specific level (Corcoran, 2005; Wallace et al. 2013), as adopted in this study. All statements meeting the above criteria were included in the candidate item pool. In addition, all 14 of the concept mapping statements with the maximum median importance rating of 5 were also included in the item pool, to reflect the fact that these had been identified by the participants as the most important concepts within the framework.

This approach ensured that all domains of the framework were sampled for candidate items and provided a total of 45 statements which were suitable for development into potential biopsychosocial scale items.

5.4.2 Item writing

Ensuring the clarity of item wording has been described as the "cardinal rule" of item writing (Nunnally & Bernstein 1994). Item clarity is achieved through observation of a number of recommendations for item wording. These are summarised in box 5.2 below. As stated previously, the fact that the criteria for generating concept mapping statements are highly concordant with those for developing scale items is one of their distinct advantages as a source of candidate items. Further considerations are the response format and the inclusion of negatively scored items, which can help in avoiding response sets (DeVellis 2012). However, as the aim of this study is to create a new biopsychosocial scale to sit alongside the existing PABS biomedical scale, the response format is already established and will be discussed further below (section 5.4.3). It was also decided not to include negative items in the pool as neither of the existing PABS scales utilise negative

Scale items should be:	**Scale items should avoid:**
• Short • Unambiguous • Written in clear language, no jargon • Be set in a clear frame of reference, or context	• Artificially creating opinion • Leading respondent • 'Double-barrelled' statements • Negative statements • Being too precise • Extreme statements ("dead giveaway" • Value-laden words

Box 5.2: Recommendations for ensuring the clarity of candidate scale items (De Vaus 2002; DeVellis 2012; Streiner et al. 2015)

items, and their introduction in this re-development would have the potential to cause confusion and reduce the usability of the resultant scale.

The initial item writing process was conducted in two stages by the members of the investigative team (KD, AB and NF). The primary consideration in the process was to retain as much of the original content and wording as possible from the original concept mapping statement. KD developed a first draft of each of the 45 statements converted into an attitudinal or belief item. All three investigators then met to discuss the pool of first draft items and agreed amendments to generate a second draft of the item pool. This version of the candidate item pool was then subject to expert review, described in section 5.6 below.

5.4.3 Response format

A further consideration when developing a new measurement scale is the choice of response format for the measure (Netemeyer et al. 2003). As the aim of this study was to develop a new biopsychosocial scale for the existing PABS, candidate items were developed with the established six-point Likert scale, the anchors for which were 'totally disagree' and 'totally agree'. However, there are a number of important implications associated with the use of the Likert scale format; most specifically the number of response options and the use of an even, rather than odd, number of response options. An even number of response choices does not offer respondents a mid-point option, but rather forces them to either agree or disagree with the item, at least to some extent (Streiner et al. 2015). While this might avoid the problem of respondents defaulting to a position of neutrality (Adelson & McCoach 2010), it can also make responding difficult for those who feel genuinely ambivalent towards the item (Clark & Watson 1995). Less than five responses have been

suggested to result in markedly reduced reliability coefficients and yet seven or more options mean that respondents' ability to discriminate between options deteriorates (Netemeyer et al. 2003). The six-point Likert scale, which is used in the existing PABS and here in this item generation process too, is considered acceptable (Netemeyer et al. 2003).

5.4.4 Item review with expert group

The final stage in this item writing process was to seek the judgement of an expert group with regard to the content and face validity of the item pool (de Vet et al. 2011). The expert group selected were participants from both the local and international concept mapping groups who had engaged in either or both of the structuring and interpretation phases of the concept mapping process. Thirteen participants were emailed the 45 draft biopsychosocial scale items and asked to review them, with particular attention to whether they found the items to be clear, unambiguous and understandable. Responses were received from nine of the original concept mapping participants and collated for each of the items. The feedback was then reviewed by the members of the investigative team (KD, AB and NF) and where it was consistent across a number of participants, or was particularly pertinent or strong, further revisions were made to the items. Table 5.1 provides the details of the entire item writing process for all 45 of the new biopsychosocial items, including: The source concept mapping statement(s) and domain of origin, an initial draft of the item, a summary of expert group feedback and the details of any subsequent amendments. The final column of the table contains the final version of the statement taken forward for testing.

Table 5.1 Details of the item writing process for the 45 new biopsychosocial scale items

Item no.*	Primary domain	Original concept mapping statement(s)	Second draft of item	Nature of comments (number of participants who commented)	Final version of item
52	Bio-clinical	The impact of other symptoms or health problems (reworded from g76 and g14 – in comorbidity 3^{o} domain)	Other symptoms or health problems have an impact on musculoskeletal pain	No comments	**Other symptoms or health problems have an impact on pain**
33	Bio-clinical	(half of) g88 - The patient's level of pain *(and limitation in activity of daily living)*	A patient's pain severity should be considered in the management of their musculoskeletal pain problem	Suggesting a single word substitution or removal (1)	**A patient's pain severity should be considered in the management of their pain**
55	Bio-clinical	r35/4 - The patient's current level of physical function	A patient's current level of physical function should be considered in the management of their musculoskeletal pain problem	Suggesting a single word substitution or removal (3)	**A patient's current level of physical function should be considered in the management of their pain**
42	Bio-clinical	g81 - A patient's level of physical activity	A patient's physical activity level should be considered in the management of their musculoskeletal pain problem	Suggesting a single word substitution or removal (2)	**A patient's physical activity level should be considered in the management of their pain**
56	Bio-clinical	The use of appropriate diagnostic tests and investigations (reworded from g38/g26 and r52)	Diagnostic tests and investigations should be used for all patients	Possibility that use of 'all' might lead to extreme responses (1) Suggested wording amendment(s): addition of '..with MSK pain' and removal of '.. and investigations' (2)	**Diagnostic tests and investigations should be used for all patients with pain**
47	Bio-clinical	Identifying signs and symptoms that indicate serious pathology	Signs and symptoms that indicate serious	Suggested wording amendment(s): 'must be' rather than 'should be'	**Signs and symptoms that indicate serious pathology must be identified**

		(reworded from g82/r57)	pathology should be identified	(1)	
11	Bio-clinical	r5 - The importance of assessing biological, psychological and social factors	Biological, psychological and social factors should be included in the clinical assessment	Suggestion that this might be three questions, rather than one *[Addressed by adding 'should all be included' to clarify emphasis]* (2) Suggesting a single word substitution or removal (1)	**Biological, psychological and social factors should all be included in the clinical assessment**
26	Bio-clinical	Facilitating a patient to better manage and prevent recurrences (reworded from r68/g17)	Helping a patient better manage their pain and prevent recurrence is my role as a clinician	Highlighted the shift from third to first person use of 'clinician' *[Discussed and decided that this was a legitimate attitudinal device, and has been previously used in PABS]* (1) Suggestion that this might include two components *[Considered less ambiguous following wording change]* (1) Suggesting a single word substitution or removal (2)	**My role as a clinician is to help patients better manage their pain and prevent recurrence**
45	Bio-clinical	g51 - The fact that pain is multi-factorial	The musculoskeletal pain experience is multi-factorial in nature	Questioning whether ' multi-factorial' would be understood by all *[Discussed and decided that would be understood by target audience, and was term used in original concept mapping statement]* (1) Suggesting a single word substitution or removal (2)	**How pain is experienced is multi-factorial**

60	Bio-clinical	r90 - Understanding when (further) 'biomedical' assessment and physical management is not appropriate	There comes a point when further 'biomedical' assessment and physical management is not appropriate	Suggestion that this might include two issues, rather than one *[Addressed by removing 'physical' to remove conflation of biomedical and physical management]* (2) Suggesting a single word substitution or removal (2)	**There comes a point when further biomedical assessment and management is no longer appropriate**
7	Bio-clinical	r67 - The use of best available evidence about effective treatment	Effective treatment of musculoskeletal pain must be based on the best available evidence	Potential ambiguity concerning nature of 'best available evidence' (1)	**Effective treatment of pain must be based on the best available evidence**
22	Bio-clinical	Appropriate skills to deliver a biopsychosocial approach (reworded from g29/r77)	Clinicians need to have the appropriate skills to deliver a biopsychosocial approach	Suggesting a single word substitution or removal (1)	**Clinicians need the appropriate skills to deliver a biopsychosocial approach**
53	Individual patient factors	r1 - The importance of the patient's thoughts, attitudes and feelings on their pain experience	A patient's thoughts, attitudes and feelings influence their pain experience	Suggesting a single word substitution or removal (1)	**Patients' thoughts, attitudes and feelings influence their pain**
57	Individual patient factors	What the patient expects the future holds (reworded from r61/g21)	Patients' expectations of/for the future affect their outcome	Potential ambiguity concerning nature of 'outcome' (2)	**Patients' expectations of the future affect their outcome**
23	Individual patient factors	r72 - The expectations of the patient about treatment	A patient's expectations about treatment for musculoskeletal pain affect their outcome	Suggesting a single word substitution or removal (2)	**Patients' expectations of treatment affect their outcome**
50	Individual patient factors	r46 - Whether the patient has previously had conflicting	Conflicting advice from healthcare consultations if harmful	Suggesting a single word substitution or removal (2)	**Conflicting advice from healthcare consultations is harmful**

		advice from healthcare practitioners		Possibility for high degree of agreement (1) Potential ambiguity concerning nature of 'harmful' (1)	
39	Individual patient factors	g23 - A patient's response to previous treatment	A patient's response to previous intervention(s) will impact on the success of subsequent treatment for musculoskeletal pain	Suggesting a single word substitution or removal (1) Suggestion that item may contain too many elements (1)	**A patient's response to previous treatment(s) impacts on the success of subsequent treatment**
24	Individual patient factors	Patient's understanding of their pain problem (reworded from r62/r63)	A patient's understanding about their musculoskeletal pain problem should be considered	Possibility for high degree of agreement (1) Suggesting a single word substitution or removal (2)	**Patients' understanding about their pain should be considered**
31	Individual patient factors	g35 - A patient's ability to understand information about their problem	Clinicians need to tailor the information they give to the patient's ability to understand	Suggesting a single word substitution or removal (1)	**Clinicians must tailor information to the patient's ability to understand**
2	Individual patient factors	r37 - The patient's preferences about treatments	A patient's preferences about treatment must be considered	Possibility for high degree of agreement (1) Suggesting a single word substitution or removal (1)	**A patient's preferences about treatment must be considered**
14	Individual patient factors	r41/3 - How the patient currently copes with their pain problem	How a patient currently copes with their pain problem must be assessed	Suggesting a single word substitution or removal (2)	**How a patient currently copes with their pain problem must be assessed**
62	Individual patient factors	A patient's confidence in their ability to control their pain problem (reworded from r40/g1)	I routinely assess how confident my patients are in their ability to	Suggesting a single word substitution or removal (3)	**I routinely assess how confident my patients are in their ability to manage their pain**

			manage their pain problem		
16	Individual patient factors	r64 - The patient's *(level of)* motivation to engage in treatment	A patient with poor motivation to engage in treatment will have a poor outcome	Possibility for high degree of agreement (1) Suggesting a single word substitution or removal (1)	**A patient with low motivation to engage in treatment will have a poor outcome**
59	Therapeutic relationship	g79/15 - Reducing a patient's fear	Reducing a patient's fear is essential to the treatment process	Potential ambiguity concerning nature of 'a patient's fear' *[Addressed by providing the context of fear about pain]* (4)	**It is essential to reduce a patient's fear about their pain**
61	Therapeutic relationship	g58 - Understanding that there are many different therapeutic methods that can be used and the importance of choosing the one(s) that are most likely to work with an individual patient)	I adopt the therapeutic method which I believe will be the most effective for each individual patient	Possibility for high degree of agreement (1) Suggesting a single word substitution or removal (2)	**I adapt the treatment to what I believe will be the most effective for each individual patient**
30	Therapeutic relationship	g28 - Engaging the patient in the treatment plan	I always engage my patient's in their treatment plan	Identification of grammatical/typing error (4)	**I always engage my patients in their treatment plan**
34	Therapeutic relationship	r93 - That good communication skills are an important part of the effectiveness of any intervention	Good communication skills increase the effectiveness of an intervention	Potential ambiguity concerning who's' good communication skills' (1) Suggesting a single word substitution or removal (1)	**Good clinician communication can increase the effectiveness of an intervention**
27	Therapeutic relationship	r18 - The importance of listening skills	Good listening skills are essential in the clinical management of patients	Potential ambiguity concerning whether item concerned patients in general, or patients with pain specifically (1)	**Good listening skills are essential in the clinical management of patients**

37	Therapeutic relationship	g41 - Taking the time to provide an explanation to the patient	I always take the time to provide an explanation to patients about their pain problem	Possibility for high degree of agreement (despite what might actually do in practice) (2) Suggestion that it may be better if bad explanations are not provided (1) Suggesting a single word substitution or removal (2)	**I always take time to provide an explanation about the patient's pain**
54	Therapeutic relationship	g40 - Meeting the information needs of the patient	The information needs of a patient should always be met	Possibility for high degree of agreement (1) Suggestion that an additional statement be added concerning the identification of patient needs *[Decided that inappropriate to add further content to item]* *(1)*	**The information needs of a patient must be met**
17	Therapeutic relationship	r6 - Understanding the patient's beliefs about the cause of their problem	A patient's beliefs about the cause of their musculoskeletal pain must be understood	Suggestion that addressing (patient) beliefs should also be included in the item *[Decided that inappropriate to add further content to item]* *(1)*	**A patient's beliefs about the cause of their pain must be understood**
8	Therapeutic relationship	r22&23/12 - That treatment goals are *(realistic and)* agreed between the patient and the practitioner	The patient must always be involved in setting the goals of treatment	No comments	**The patient must always be involved in setting the goals of treatment**
18	Therapeutic relationship	r91/12 - The need to have a clear understanding of the specific goals of treatment	Specific and realistic goals for treatment must be agreed	Suggesting a single word substitution or removal (2)	**Specific and realistic goals for treatment must be agreed with the patient**

58	Therapeutic relationship	r56/12 - The importance of the relationship between the healthcare provider and the patient	The clinician-patient relationship is a key component in the outcome of treatment	*Was omitted from pilot exercise in error*	**The clinician-patient relationship is a key component in the outcome of treatment**
41	Social issues	g56/8 - A patient's social support network	I consider a patient's social support network in my clinical management	Suggestion that use of 'clinical management' was a new/different concept to more frequently used term 'treatment' *[The term 'clinical management' was chosen deliberately to reflect the nature of 'social support' and that it may not directly, or solely, impinge on treatment per se]* (1)	**I consider a patient's social support network in my clinical management**
21	Social issues	r12 - Family and friend's effect on the patient's problem	A patient's family and friends have an effect on their musculoskeletal pain problem	Suggesting a single word substitution or removal (2)	**Family and friends have an effect on a patient's pain**
15	Social issues	r65 - The reaction of family and friends to the patient's problem	The reaction of a patient's family and friends will promote recovery	Suggestion that 'reaction' is a potentially ambiguous term and that can be both positive and negative *[Addressed by substituting 'promote' with 'impact on' to remove direction of effect on recovery]* (3)	**The reaction of family and friends will impact on a patient's recovery**
13	Social issues	The availability of community based opportunities for self-management (reworded from g30/12)	A clinician must know what community based opportunities are available to support self-management	Potential ambiguity concerning nature of 'community based opportunities' *[Addressed with wording change]* (1) Suggesting a single word substitution or removal (1)	**A clinician must know what resources are available in the community to support self-management**
32		g63/1 - A patient's perception of their future ability to work	Return to work depends on a patient's	No comments	**Return to work depends on a patient's perception of their ability to work**

			perception of their ability to work		
12	Work	g47 - A patient's perception of the link between their job and their symptoms	Successful return to work depends on a patient's perception of the link between their job and their symptoms	Concern that item "sounds like patient blaming and siding with the business interest" (1) *[Item retained as content and wording derived from original concept mapping statement]*	**Successful return to work depends on a patient's perception of the link between their job and their symptoms**
51	Work	The patient's workplace environment (reworded from g12/r7)	A patient's workplace environment will impact on their musculoskeletal pain problem	Suggesting a single word substitution or removal (1)	**A patient's workplace environment will impact on their pain**
63	Work	The impact of the pain problem on ability to work (reworded from g46/4)	I always assess the impact of a patient's pain problem on their ability to work	Suggesting a single word substitution or removal (3)	**I always assess the impact of a patient's pain on their ability to work**
20	Work	r79 - A patient's perceived barriers to work	A patient's perceived barriers to work must be assessed	Suggesting a single word substitution or removal (1)	**A patient's perceived barriers to work must be assessed**
48	Emotions	r4/3 - The emotional state of the patient	A patient's emotional state impacts on their musculoskeletal pain	Suggesting a single word substitution or removal (1)	**A patient's emotional state impacts on their pain**
38	Emotions	r43/4 - The impact of co-existing anxiety and depression	Anxiety and depression are key factors to consider	Suggestion that item is unclear or incomplete *[Addressed by adding context of treatment]* (4)	**Anxiety and depression are key factors to consider when treating patients with pain**

Notes: *in final survey questionnaire, detailed in chapter 6; g=local group statement; r=international group statement

5.5 Adaptation of the existing PABS items for use in a generic MSK version

One of the dual aims of this thesis was to develop a generic version of the PABS for use across all common MSK conditions. Although the new biopsychosocial items had been purposively developed in the context of common MSK pain generally, the existing PABS items were originally developed to capture HCPs' attitudes and beliefs about (chronic) LBP. However, the regional focus of the existing items has been altered in previous studies by substituting 'low back pain' with, for example 'neck pain' (Vonk et al. 2009) and was therefore simply replaced with 'pain' in this study. The focus on all common MSK pain, rather than regional specific presentations, was also emphasised in the explanatory notes and instructions which were developed to accompany the items. These can be inspected in the materials produced for the survey (described in chapter 6) which are included in appendices 11 and 12.

As described in section 2.8, a total of 36 PABS items have previously been included in a number of the previous development and testing studies of the PABS (Ostelo et al. 2003; Houben et al. 2005; Mutsaers et al. 2014; Eland et al. 2016); and various combinations of these items have been included in different studies using the PABS (Jellema et al. 2005; Bishop et al. 2008; Watson et al. 2008). However, the 19-items of the amended PABS proposed by Houben et al (2005) were selected for inclusion in this study as it is the most widely and consistently utilised version of the PABS to date, as evidenced by the findings of the scoping review described in chapter 3.

5.6 Conclusion and plans for testing the extended item pool within a scale development process and the measurement properties of the PABS-MSK

This item development stage concludes the substantive phase of the scale development process (Simms & Watson 2007). The next, structural phase concerns the collection of responses to the extended pool of items, generating and implementing an item selection strategy and constructing a provisional scale (Simms & Watson 2007). As this programme of work is concerned with the initial development and testing of a new generic version of the PABS (PABS-MSK), not all the psychometric properties described in section 2.6 will be examined. Scale development and testing is an iterative process (de Vet et al. 2011) and therefore the findings of the work described in the remainder of this thesis will determine the requirements for further development and testing of the PABS-MSK.

The remaining three stages of work undertaken to meet the aims of the thesis detailed in section 1.3 are:

- A national survey of general practitioners (GPs), chiropractors and physiotherapists to collect data on the candidate biopsychosocial items and the generic versions of the existing PABS items developed (Chapter 6)
- Development and initial testing of a new measure of HCP's attitudes and beliefs about common MSK pain (the PABS-MSK) (Chapter 7). This stage will include examination of the structural validity and internal consistency of both scales of the PABS-MSK
- Further psychometric analysis to establish the test-retest reliability, measurement error and smallest detectable change (SDC) of the redeveloped, generic PABS-MSK (Chapter 8)

Chapter 6: Development of a new generic musculoskeletal version of the Pain Attitudes and Beliefs Scale: A national survey of General Practitioners, Chiropractors and Physiotherapists

Chapter 6: Development of a new generic musculoskeletal version of the Pain Attitudes and Beliefs Scale: A national survey of General Practitioners, Chiropractors and Physiotherapists

6.1 Chapter introduction

This chapter describes the nationwide postal survey of UK-based HCPs' attitudes and beliefs about common MSK pain which formed the fourth stage of this scale development process. The survey included both baseline data collection and a smaller retest component using a questionnaire which contained the pool of new biopsychosocial items and the re-worded, generic-MSK versions of the existing PABS items (the development of which was described in chapter 5). The resultant data were then used in two stages of psychometric analysis; first the initial item testing, scale development and structural validation procedures which are described next in chapter 7 and second, the test-retest reliability analyses which are the focus of chapter 8. Appendices 6, 11 and 12 contain the supporting materials which are referenced within this chapter.

6.2 Aim and objectives

The aim of this survey was to collect responses to the extended pool of new and existing biopsychosocial items and the generic versions of the existing biomedical items in order to conduct subsequent stages of scale development and psychometric testing of the new PABS-MSK. The specific objectives developed to meet this aim were:

1. To obtain item responses from representative samples of a number of different HCP groups who are experienced in working with patients with MSK conditions

2. To obtain baseline and retest data from a sufficient sample size to provide the number of responses required to conduct the planned psychometric analyses

6.3 Theoretical considerations

The purpose of this survey was to collect the necessary data for the psychometric analyses required within the scale development process. The principal procedures to be employed in the first stage of item testing and structural validation were exploratory factor analysis (EFA) of the new and existing biopsychosocial PABS items, the results of which would determine the composition of any proposed new biopsychosocial scale; and confirmatory factor analysis (CFA) of both a new biopsychosocial scale and the generic-MSK version of the existing PABS biomedical scale. The test-retest reliability analyses planned for the second stage comprised calculation of the intraclass correlation coefficient (ICC), standard error of measurement (SEM) and smallest detectable change (SDC) for each scale of the proposed new PABS-MSK.

There are a number of attendant recommendations for data subjected to each of these analyses, which required consideration in the design of this survey to ensure that the resultant data were suitable for the proposed analyses. In addition to the requirement for all inferential statistics to be performed on data obtained from a representative sample (Kline 1994; Streiner et al. 2015), the most influential of these recommendations pertain to the number and range of responses from participants.

The reliability of factor analysis is known to be influenced by sample size (Kline 1994; Field 2009), however there has been much debate about the numbers required for EFA. The literature provides guidance in terms of several 'rules of thumb' concerning the appropriate ratio of participants to items included in the analysis (Floyd & Widaman 1995), with recommendations varying from a ratio of 4:1 to 10:1 (Costello & Osborne 2005; de Vet et al. 2011). The empirical basis for these recommendations is unclear (Field 2009) and it has

been recognised that other factors such as the magnitude of factor loadings and absolute sample size can have a greater influence on the reliability of the factor solution than the participant to item ratio (Guadagnoli & Velicer 1988; MacCallum et al. 1999). Specifications for minimum sample size also vary, and it has been observed that the general maxim of 'the more the better' has historically prevailed (Floyd & Widaman 1995). However, it has been observed that beyond 300 participants, test parameters are generally stable irrespective of the participant to item ratio (Kass & Tinsley 1979). In the quality criteria for measurement properties proposed by the COSMIN initiative, an adequate sample size is defined as having a participant to item ratio of 7:1 but no less than 100 participants (Mokkink, Terwee, Patrick, et al. 2010).

There are also a number of different 'rules of thumb' advocated in determining an adequate sample size for the application of CFA. These include minimum ratios of 10:1 and 5:1 between the number of participants and the number of items or model parameters respectively; and that sample size should exceed 200 (Myers et al. 2011). In addition, confirmation of a hypothesised factor structure must be conducted in a different sample from any preceding EFA. If conducted in the same sample, the structure is not tested but merely replicated as the variance in the dataset is identical to that used in the EFA (de Vet et al. 2011).

The sample size requirements for the planned reliability analyses are far less onerous with a minimum of 50 responses being recommended by the COSMIN initiative (Terwee et al. 2007; de Vet et al. 2011). However, the interpretation of reliability parameters is dependent on the variability of the construct of interest, or range of responses, within the

sample (de Vet et al. 2011). The distribution of item responses is also pertinent within factor analysis which is, conventionally, premised on the assumption that data are normally distributed (Tabachnick & Fidell 2007). Beyond the considerations of statistical analysis and interpretation, the range of responses elicited by an item is a key determinant of its utility within a measurement instrument. An item that attracts a highly skewed or narrow range of responses from a sample which might be expected to differ on the construct in question, is less able to discriminate between groups or to demonstrate responsiveness to any change in the target construct (de Vet et al. 2011).

While the survey method is an established method of testing items in large numbers of randomly selected participants (Streiner et al. 2015), the likelihood that the number and nature of responses are appropriate can be enhanced by several aspects of the survey design. For example, recruiting a range of participants who are known to, or who have previously been found to differ on the construct of interest, using knowledge of the response rates of previous surveys to inform sample size and considering the content and quality of the survey materials and processes (De Vaus 2002; DeVellis 2012).

6.4 Methods

6.4.1 The survey method

To enable data collection from the types and number of individuals required for this scale development process, a survey was chosen. Survey research involves the collection of data from a sample drawn from a defined population through the use of a questionnaire (Visser et al. 2000; de Leeuw et al. 2008) and is an established technique for capturing

characteristics such as knowledge, self-reported behaviour and attitude (Sim & Wright 2000).

The data collection method employed for this survey was a self-administered postal questionnaire. Since the PABS has been developed and exclusively implemented as a self-administered instrument (Ostelo et al. 2003; Houben et al. 2005), it was also considered that testing the items in this format was both appropriate and desirable, given the likelihood that the redeveloped PABS-MSK will continue to be used in this way.

While either a postal or an electronic survey would have been appropriate for collecting data from the large and geographically dispersed samples used in this study, the postal method was selected for a number of reasons. Firstly, the contact details of HCPs provided by their respective professional bodies were postal addresses. Secondly, although low and declining response rates have been recognised as problematic in postal surveys of HCPs generally, and medical doctors specifically (Cook et al. 2009; Glidewell et al. 2012), they have tended to result in higher response rates than electronic distribution of surveys to date (Dykema et al. 2013; Cho et al. 2013). Thirdly, if an electronic survey is administered via an internet site or professional network (as opposed to being emailed directly to a sample of known individuals) it is not possible to ensure that coverage of the population of interest is adequate and the subsequent lack of a clear denominator makes it impossible to ascertain accurate response rates (Lohr 2008). These issues increase the risk of obtaining an unrepresentative sample and potentially biased data, and therefore threaten the validity of the results from surveys (De Vaus 2002).

6.4.2 Study design

The design of the study was a nationwide postal survey of a range of UK-based HCPs involved in the management of patients with common MSK pain, conducted in two phases. The first phase was a cross-sectional survey designed to obtain sufficient responses for the subsequent factor analyses of the existing and candidate PABS items (described in chapter 7). Phase two was a retest survey of a sub-sample of consenting respondents from phase one, designed to obtain sufficient responses for the planned reliability analysis (described in chapter 8). The survey was conducted between November 2013 and February 2014. In order to avoid the busy Christmas period, baseline mailings were completed before the end of November 2013 and retest questionnaires not sent until the New Year.

6.4.3 Participants and recruitment

This survey sought to recruit clinically-active, UK-based HCPs from three different professional groups: GPs, physiotherapists and chiropractors. These groups were chosen for two reasons, the first being that collectively they are involved in the management of the majority of common MSK presentations in primary care in the UK (Hartvigsen et al. 2011; Foster et al. 2012). The second reason was that previous studies have found that GPs, chiropractors and physiotherapists demonstrate varying attitudes and beliefs towards MSK pain (Darlow et al. 2012; Pincus et al. 2012 in Hasenbring et al. 2012). Chiropractors have been found to express stronger biomedical and weaker biopsychosocial attitudes than GPs (Bishop et al. 2008; Innes et al. 2015), who in turn have reported higher biomedical attitude scores than physiotherapists (Fullen et al. 2011; Watson et al. 2008; Bowey-Morris et al. 2010). Therefore it was hoped that a range of responses across items in both scales would be achieved.

It was possible that the samples of all three HCP groups might include individuals who worked exclusively in non-clinical roles such as management, research or education and would therefore be excluded from the study. Given the MSK speciality of chiropractors, it was anticipated that the majority of chiropractors sampled would routinely see patients with common MSK conditions. Similarly, due to the significant proportion of GP consultations that concern MSK conditions (Jordan et al. 2010), it was also expected that most practising GPs would regularly see patients with common MSK conditions. However, due to the range of clinical specialities in which physiotherapists may work and specialise and the nature of rotational posts in early physiotherapy careers, where several months are spent working in one clinical speciality before rotating to another, it was possible that some of those sampled might not be currently involved in the management of patients with MSK pain. A timeframe of six months was chosen to allow the inclusion of clinicians who may not currently be working with MSK pain patients, but who had recent experience of this. Therefore, one exclusion criterion for survey participation were HCPs who had not been involved in the management of patients with MSK pain for more than six months.

6.4.4 Inclusion and exclusion criteria

Participants were therefore included in the study if they:

- Were a registered, practising GP, chiropractor or physiotherapist
- Had treated a patient with MSK pain in the preceding six months

Participants were excluded from the study if they:

- Did not work in the United Kingdom
- Had not treated a patient with MSK pain in the preceding six months

- Were retired from clinical practice or had been on maternity leave for longer than six months

6.4.5 Sampling method

The theoretical considerations regarding sampling were discussed in section 6.2 and underpin the choices made in this study.

In the stages of analysis which followed in this scale development process (described later in chapters 7 and 8), it was intended that the data from the three HCP samples be analysed as a single dataset. However, in anticipation that representative samples of each of the three professional groups would provide the greatest cumulative variance across the PABS response options, securing a representative sample of each professional group was a key objective. A representative sample of each HCP group was achieved through simple random probability sampling. Probability sampling usually necessitates access to a complete sampling frame, where all members of the target population have a chance of being sampled (Bourque & Fielder 2003). Although complete sampling frames were not available for this study, as is often the case, comprehensive sampling frames were available for two of the included HCP groups, the GPs and chiropractors.

Identification of appropriate sampling frames for these two groups was conducted with the cooperation of the following organisations: Binley's (Beechwood House Publishing) who, in conjunction with the Royal College of General Practitioners, maintain a database of all GPs working in the NHS; and the British Chiropractic Association (BCA) which is the largest association for chiropractors in the UK with its membership comprising over 50% of the UK's registered chiropractors. These sampling frames have previously been used

successfully in similar surveys of HCPs conducted by researchers within the iPCHS at Keele University (Bishop et al. 2008; Holden et al. 2009; Evans et al. 2010).

A similarly comprehensive sampling frame for MSK physiotherapists in the UK is not currently available, as the Chartered Society of Physiotherapy (CSP) does not provide a facility for researchers to access simple random samples of their members. The Acupuncture Association of Chartered Physiotherapists (AACP) had successfully administered a previous survey on behalf of researchers within the iPCHS (Bishop et al. 2016) and they agreed to provide a simple random sample of their membership for the current study. It was determined that the large population of UK-based physiotherapists that the AACP includes (with over 6000 members) was likely to return a more representative and heterogeneous sample, in terms of physiotherapists' attitudes and beliefs about MSK pain, than one taken from those attending a special interest meeting or training event. Convenience samples of this type have been used in previous studies of HCPs' attitudes and beliefs (Laekeman et al. 2008; Eva et al. 2013; Mutsaers et al. 2014) and in this study was considered a pragmatic choice for obtaining as representative as possible a sample of physiotherapists.

The sampling frame for the second, retest reliability component of the survey was the HCPs who had responded to the initial baseline survey and consented to further contact. A convenience sample was created using the first 50 responders from each professional group who consented to further contact. This was a pragmatic decision made with the intention of achieving as much consistency in the six-week retest period across the sample as possible (more details are provided later in chapter 8).

6.4.6 Sample size

6.4.6.1 Sample size for initial baseline survey

The theoretical considerations in determining the sample sizes required for the planned psychometric analyses were discussed in section 6.2, and underpin the choices made in this study. As explained previously in chapter 5, the pool of biopsychosocial items for the PABS contained the 45 new and 9 existing items making a total of 54 items before any exclusions. To meet the criteria recommended by Terwee et al. (2007) of seven participants to each item, a sample of 378 would therefore be required to conduct EFA on the full pool of biopsychosocial items; a sample size which would also meet the threshold for stability of 300 participants recommended by Kass and Tinsley (1979) (Terwee et al. 2007; Kass & Tinsley 1979).

As discussed in section 6.2, there are no specific recommendations for sample size for CFA beyond the general guide of a ratio of five to ten participants per item (Floyd & Widaman 1995). Given the practical desirability of partnering the existing PABS biomedical scale with a new biopsychosocial scale of similar length, it was considered unlikely that more than 10 to 15 items would be included in the CFA of the proposed new scale. A sample of 200 was therefore considered adequate to conduct a CFA on any model derived from the EFA of the biopsychosocial items.

The sample for the first stage of analysis had to be sufficiently large to divide into two sub-samples; the first in the region of 378 participants to support the planned EFA of up to 54 biopsychosocial items and a second in the region of 200 participants to support the subsequent CFA. It was therefore determined that a sample of 580 HCP responses was

needed to ensure sufficient numbers for both the initial EFA and then CFA of the biopsychosocial items included. For the 10 existing biomedical items, only CFA was to be performed so no separate samples were required and all responses could be included in this analysis.

Response rates to surveys of UK-based GPs about MSK pain are known to be low with similar postal cross-sectional questionnaire surveys achieving 18 to 22% (Cottrell et al. 2015; Bishop et al. 2008). In contrast, the response rates to similar surveys of UK-based chiropractors and physiotherapists tend to be higher, at approximately 50 to 55% (Evans et al. 2010; Bishop et al. 2008). To ensure that the target of 580 participants was met and that the sample would include approximately equal proportions of responses from each HCP group, oversampling was employed, such that samples of 1000 GPs, 500 physiotherapists and 500 chiropractors were obtained for the survey. However, one chiropractor was removed from the sample provided by the BCA prior to mailing, as the contact address supplied was outside the UK.

6.4.6.2 Sample size for the retest component of the survey

It is recommended that a minimum of 50 responses are required for estimating test-retest reliability (Terwee et al. 2007). Response rates to test-retest surveys of the PABS have been shown to be in excess of 50% (Bowey-Morris et al. 2010; Kernot et al. 2015), therefore a retest sample of 150 was composed of the first 50 participants from each professional group to respond to the baseline questionnaire and consent to further contact. In summary, it was calculated that responses from 580 participants in the baseline survey and 50 participants in the retest survey would be sufficient for the subsequent analyses.

6.4.7 Design and development of survey materials

There are a number of established strategies incorporated into the design of surveys of HCPs to maximise response rate and quality. Cho et al. (2013) differentiate these into either incentive-based interventions, which may be monetary or non-monetary; or design-based interventions such as questionnaire format, personalised mailings and reminders or prompts (Cho et al. 2013). Many of these procedures are incorporated in the tailored design method (TDM) for surveys advocated by Dilman (1978, 2007) which has been used in previous studies of HCPs' attitudes and beliefs about MSK pain (Buchbinder et al. 2001; Fullen et al. 2011). Features of the TDM have also informed the established methods for postal surveys conducted by researchers within the iPCHS, which have been refined through the conduct of several national surveys of HCPs (Bishop et al. 2008; Holden et al. 2008; Cottrell et al. 2010).

The TDM is based on social exchange theory, which concerns the exchange and reciprocation of favours (de Leeuw & Hox 2008) and aims to maximise the response rate to self-administered surveys. The three elements of social exchange theory operationalised in TDM are rewards, costs and trust (Dillman 1979). In this study, 'rewards' were psychological, rather than material and were explicitly articulated in terms of the value of the participant's contribution, gratitude for their response and the offer of a summary of the results. Designing questionnaires to be interesting and easy to respond to is also categorised as a 'reward' in the TDM literature (de Leeuw & Hox 2008). The 'costs' to participants in terms of effort, time and money were minimised by keeping the questionnaire and associated materials as succinct as possible and including a pre-paid envelope for the return of the completed questionnaire. The trustworthiness and

legitimacy of the study was demonstrated by the use of the iPCHS at Keele University's official letterhead, recognition of the relevant professional bodies in the procurement of the participant's contact details, the guarantee of anonymity in terms of data analysis and reporting, and the provision of contact information for the study team. The principles of the TDM also informed the mailing procedures utilised for this survey, described in section 6.4.8 below.

6.4.7.1 Initial baseline questionnaire

The questionnaire developed for the baseline survey consisted of two sections preceded by a front page containing the filter question which asked whether the participant had treated a patient with MSK pain in the preceding six months, brief explanatory notes and instructions for its completion. The final page of the questionnaire included a consent form which respondents were asked to complete if they wished to give consent to further contact and possible inclusion in a follow-up component of the survey. Consent to use the data obtained from the initial questionnaire was implied from returning that questionnaire. The focus of this survey on HCPs' attitudes and beliefs concerning common MSK pain in general, rather than regionally specific MSK pain, was emphasised in the explanatory notes and instructions included in the questionnaire and accompanying participant information. Full details of the survey pack are provided in section 6.4.8 and a copy of the questionnaire and cover letter are included in appendices 11 and 12.

The first section of the questionnaire included items concerning the demographic and practice characteristics of participants. These data were collected to allow description of the respondents. These items included years in practice, gender, work setting, clinical

specialism and whether respondents had participated in specific postgraduate training in MSK conditions. The second section of the questionnaire comprised the 45 new biopsychosocial items and the generic-MSK versions of the existing 19-item PABS (Houben et al. 2005), the development of which was detailed previously in chapter 5. The order of the test items was randomised to ensure that the existing biomedical and the new and existing biopsychosocial items were commingled, to discourage respondents from entering into a 'response set' where similar answers are provided for all questions (Streiner et al. 2015).

6.4.7.2 Retest questionnaire

The retest questionnaire developed for the second part of the survey contained just the pool of existing and new PABS items. The information and message of thanks included on the first and last pages of the questionnaire respectively were amended to reflect the repeat nature of the questionnaire and the additional contribution made by the respondents.

The questionnaires and all associated letters and materials were reviewed for quality by the research supervisors and a research programme manager in the iPCHS prior to their submission to the Research Ethics Committee.

6.4.8 Mailing procedure and data management

6.4.8.1 Mailing

All sampled HCPs were sent an initial study pack containing a personally addressed letter of invitation to participate, an information sheet, a copy of the first questionnaire and a postage-paid reply envelope. Each participant was pre-assigned a unique study number

which was attached to the questionnaire before mailing. This allowed the consent for further contact form at the end of the questionnaire to be removed on return, maintaining anonymity in the onward processing of the questionnaire data.

To optimise the response rate to the survey, two reminder mailings were sent to participants who did not responded to the previous mailing(s). This is consistent with the TDM (Dillman 2007) in which it is suggested that repeated contacts are designed to look different or offer new information to encourage response (de Leeuw & Hox 2008). A reminder postcard was sent at two weeks after the initial mailing and a reminder letter with a second copy of the study pack at four weeks.

The retest questionnaire was sent to the first 50 consenting respondents from each of the three professional groups (150 participants in total) six weeks after the return of their first questionnaire. De Vet et al. (2011) recommend a minimum of two weeks between questionnaires, however six weeks was chosen for this study in order to bridge the Christmas period (de Vet et al. 2011). Six weeks was considered to be acceptable since HCPs attitudes and beliefs are unlikely to change rapidly (Reid 2006; Zusman 2011). The retest questionnaire was again sent with an invitation letter, participant information sheet and a postage-paid reply envelope. Reminders were sent at two and four weeks, as for the baseline mailing.

6.4.8.2 Receipt of completed questionnaires, data entry, checking and cleaning

As completed questionnaires from both the baseline and retest phase were returned, the response, date of receipt and consent for further contact were logged in a secure administrative database. Though there are limitations to excluding cases with missing data,

it is one of the most common methods of managing cases with partial non-response (Bowling 2014; Baraldi & Enders 2010). There is no clear recommendation for determining problematic levels of partial non-response (Brick & Kalton 1996), and so a pragmatic decision was taken to exclude cases with five or more missing or un-interpretable responses in section 2 of the questionnaire i.e. the PABS items. The data for analysis were entered into a second secure database and when data entry was complete, the data were checked for errors by a second person. Data cleaning and preparation were then conducted in the Statistical Package for Social Scientists for Windows (SPSS Inc., Chicago IL. Version 21) by the author with the support of a statistician (ET). An overview of the complete survey process illustrating the organisation and timing of the mailings is provided in figure 6.1.

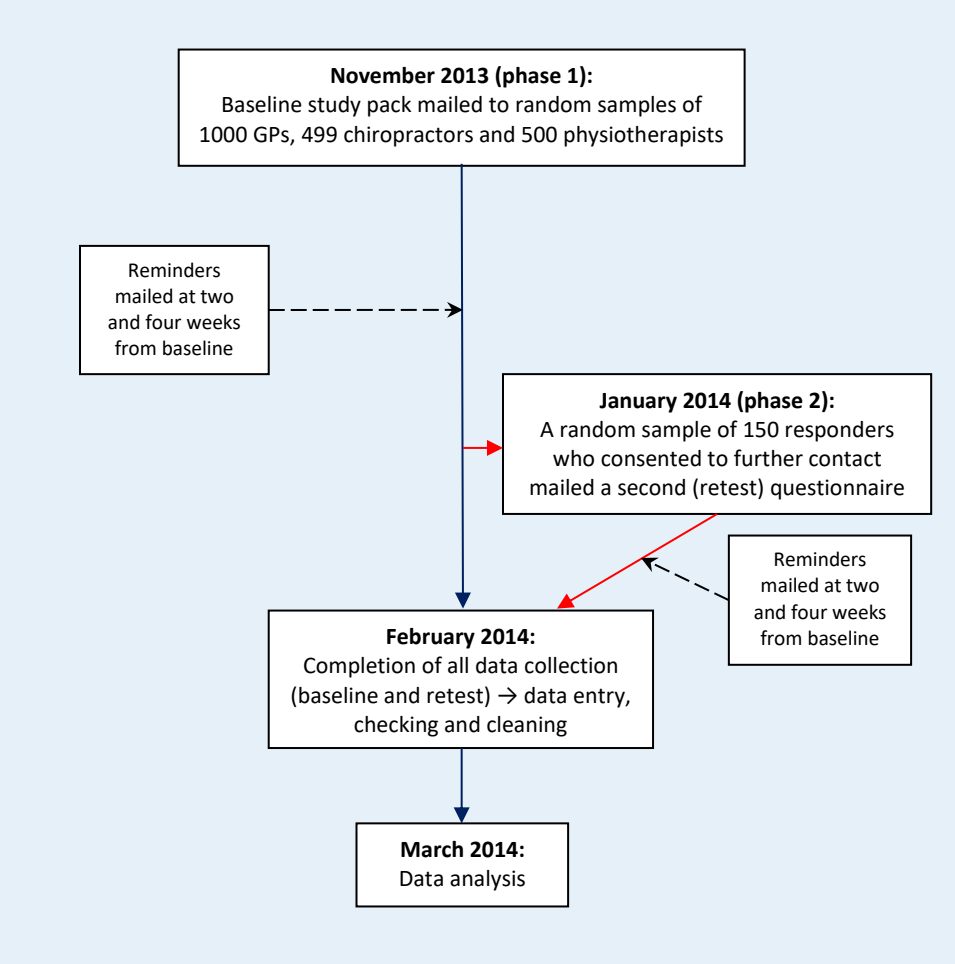


Figure 6.1: Flowchart of survey process

6.4.9 Analysis of survey response

Since the following chapters will provide full detail of the psychometric analyses of survey responses in terms of the factor structure and test-retest reliability, here analysis was limited to that concerning only the response to the questionnaires. This includes response rates, respondent characteristics and the mean scores on the generic-MSK versions of the existing PABS scales for each professional group. Further examination of the item-level data, including its distribution, was undertaken prior to the subsequent factor analyses, and is therefore presented in chapter 7.

Data collected at baseline and retest were collated in Microsoft Access and then transferred into SPSS for subsequent analysis. Descriptive statistics such as mean values, standard deviations, frequencies and percentages were calculated to show responses, response rates and respondent characteristics for each HCP group. Although the existing PABS, particularly the existing biopsychosocial scale, is limited, the results of the existing biomedical and biopsychosocial scales will be presented in order to understand the respondents to this survey, and whether the respondents may be different or similar to the respondents to previous surveys in terms of their attitudes and beliefs about MSK pain.

6.4.10 Research approvals

Ethical approval for this survey was granted by Keele University's Ethical Review Panel on the 9th October 2013 and NHS Assurance was obtained on the 6th November 2013. The letters of approval are included in appendix 6.

6.5 Results

6.5.1 Response Rates

Figure 6.2 details the responses, withdrawals and exclusions from all three HCP groups. From the 1999 baseline invitation packs mailed out responses were received from 692 HCPs. Of these 105 were either withdrawn or excluded providing 587 analysable responses or an overall response rate of 31% (587 of 1894). The applicable response rates for the different HCP groups were: 18.1% for GPs (176 of 974), 48.3% for chiropractors (235 of 487), and 40.6% for physiotherapists (176 of 434). Of the 150 follow-up (retest) invitation packs mailed out, 116 were returned giving a response rate of 77.3%. The retest response rates for the different HCP groups were for GPs 64% (32 of 50), chiropractors 84% (42 of 50), and 84% (42 of 50), respectively.

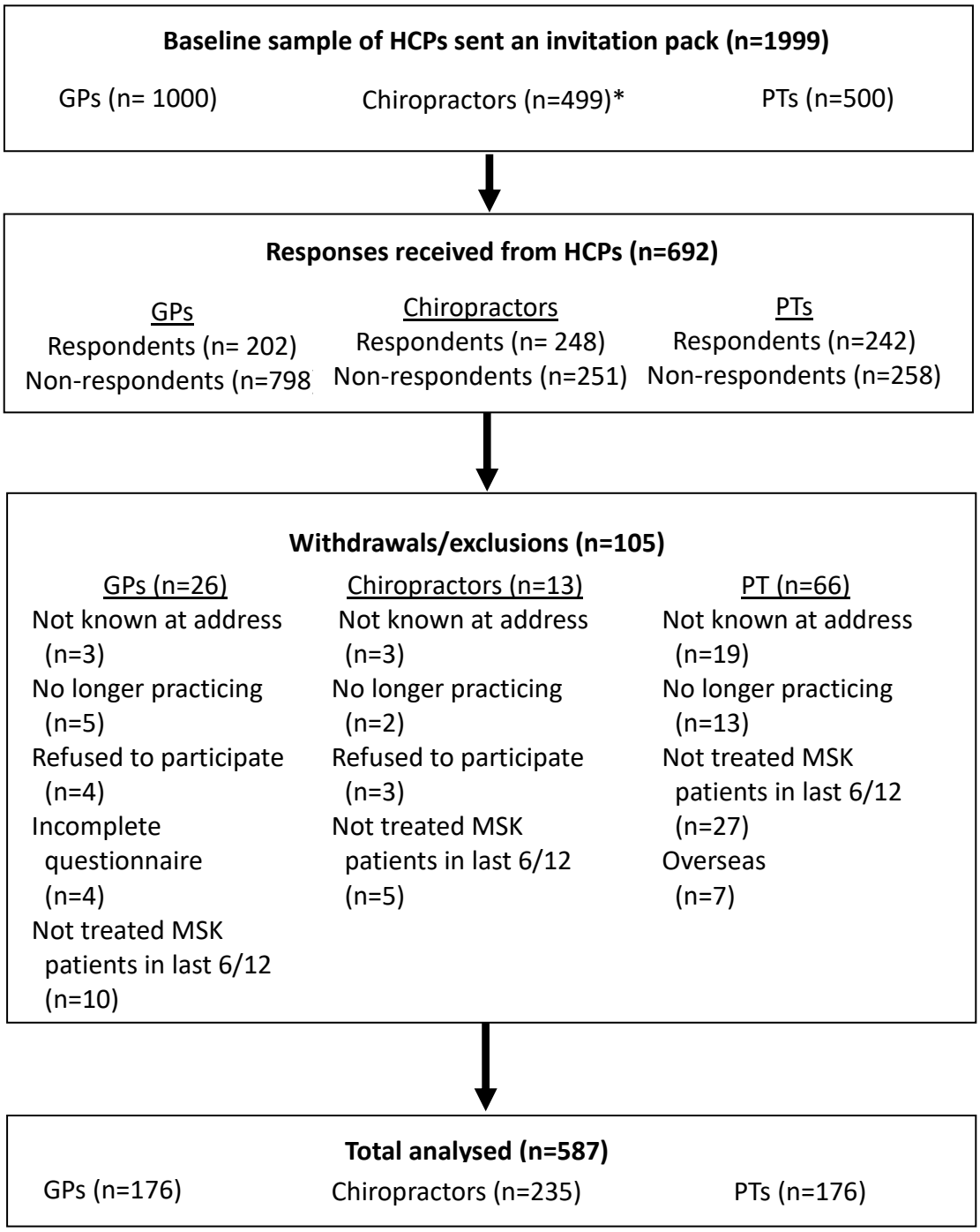


Figure 6.2. Survey flow diagram

Notes: *1 chiropractor who was working overseas was removed from sample; PT=physiotherapist; HCP= Healthcare professional; MSK=musculoskeletal

6.5.2 Data entry error checking

Initially, a one in 10 check was performed on the response data, which detected 29 separate entry errors in the 71 data sets sampled. As a result, all the data entry was double checked and a subsequent one in 10 check found just a single error in a second sample of 70 data sets.

6.5.3 Respondent characteristics

Table 6.1 summarises the characteristics of respondents from each of the three HCP groups and in total. The gender distribution was variable within each of the HCP groups with 38.8% of GPs, 49.1% of chiropractors, 79.2% of physiotherapists being female. The data on number of years qualified indicated that respondents were, on average, very experienced clinicians, with a mean time since qualification of 18.6 (10.7) years. The proportion of time spent in clinical practice was similar for GPs and physiotherapists with three quarters of them spending more than 75% of their time in a clinical role; more than 90% of chiropractors worked more than 75% of their time in a clinical role. Clinical settings were substantially different for each HCP group with 95.5% of GPs and 38.9% of physiotherapists working only in NHS settings, whilst none of the chiropractors worked in the NHS. Only 175 of 563 HCPs (31%) self-reported that they were a MSK specialist, although 402 HCPs (69%) reported that they had received some form of specific, post-qualification, MSK training. There was a considerable difference between professional groups in terms of MSK training with more than 80% of chiropractors and physiotherapists reporting that they had received specific MSK training compared to less than 40% of GPs.

Table 6.1: Characteristics of survey respondents for each HCP group and in total

HCP group (sample size)	**GPs** (n=176)	**Chiropractors** (n=235)	**Physiotherapists** (n=176)	**Total (n=587)**
Gender: % female (n)	38. 9 (68)	50.4 (116)	80.2 (138)	55.8 (322)
Years since qualification: Mean (SD)	23.8 (9.9)	13.9 (10.3)	16.1 (9.1)	18.6 (10.7)
Proportion of role which is clinical % (n)				
○ **76-100%**	77.8 (137)	93.1 (216)	77.7 (136)	83.9 (489)
○ **50-75%**	18.8 (33)	6.5 (15)	14.9 (26)	12.7 (74)
○ **<50%**	3.4 (6)	0.4 (1)	7.4 (13)	3.4 (20)
Work setting: % (n)				
○ **NHS only**	95.5 (168)	0.0 (0)	38.9 (68)	40.5 (236)
○ **Non-NHS only**	0.0 (0)	91.4 (212)	36.0 (63)	47.2 (275)
○ **Mixed settings**	4.5 (8)	8.6 (20)	25.1 (44)	12.4 (72)
Clinical speciality: % yes (n)	31.2 (54)	22.4 (49)	77.8 (133)	41.9 (236)
If yes: MSK speciality (n)	23	37	115	175
Non-MSK speciality (n)	31	12	18	61
Proportion of caseload which is common MSK pain: % (n)				
○ **76 – 100%**	0.6 (1)	70.9 (161)	33.9 (59)	38.9 (221)
○ **51 – 75%**	1.2 (2)	14.1 (32)	23.6 (41)	13.2 (75)
○ **26 – 50%**	12.6 (21)	7.0 (16)	23.0 (40)	13.6 (77)
○ **0 – 25%**	85.6 (143)	7.9 (18)	19.5 (34)	34.3(195)
Specific MSK training: % yes (n)	34.7 (61)	82.6 (192)	85.1 (149)	69.0 (402)
Highest level reported=				
○ **MSc/PhD**	2	29	34	65
○ **Formal/assessed**	3	51	58	112
○ **Informal/weekend**	56	112	57	225

Notes: n= number of cases where data was available, HCP = Healthcare practitioner, GP = General practitioner, SD = Standard deviation, NHS = National Health Service (UK), MSK = Musculoskeletal

6.5.4 Attitudes and beliefs of respondents

Table 6.2 shows the mean and range of scores for the generic versions of the existing biomedical and biopsychosocial scales of the PABS. Figures 6.3 and 6.4 show the distribution of those scores on their respective scales. Chiropractors scored higher on the biomedical scale and lower on the biopsychosocial scale than GPs and physiotherapists. The biomedical scale scores obtained from the sample ranged from 12 to 54, indicating that

nearly the full extent of the scale (10 to 60) was used and a range of biomedical attitudes was therefore gathered. Figure 6.3 also indicates that the biomedical data are normally distributed. In contrast, the biopsychosocial scale scores obtained from the sample ranged from 20 to 50, indicating that the full extent of the scale (9-54) was not used, with the scores clustering towards the upper half of the scale. Figure 6.4 indicates that the biopsychosocial data are also approximately normally distributed, but clustered at the high end of the scale, thus indicating that attitudes at the lower end of the scale were lacking in respondents.

Table 6.2: Attitudes and beliefs of respondents for each HCP group and in total

HCP group	**GPs** (n=176)	**Chiropractors** (n=235)	**Physiotherapists** (n=176)	**Total** (n=587)
Score on existing PABS biomedical scale* (scale 10-60):				
Min	17	18	12	12
Max	47	51	54	54
Mean(SD)	33.4 (5.5)	37.7 (5.9)	32.1 (6.9)	34.7 (6.5)
Score on existing PABS biopsychosocial scale* (scale 9-54):				
Min	29	22	26	22
Max	48	44	50	50
Mean(SD)	37.6 (3.5)	32.4 (4.4)	36.2 (4.2)	35.1 (4.7)

Notes: HCP = Healthcare practitioner, GP = General practitioner, SD = Standard deviation, NHS = National Health Service (UK), PABS = pain attitudes and beliefs scale, n= number of cases where data is available
*generic-MSK version of existing 19-item PABS (Houben et al. 2005**)**

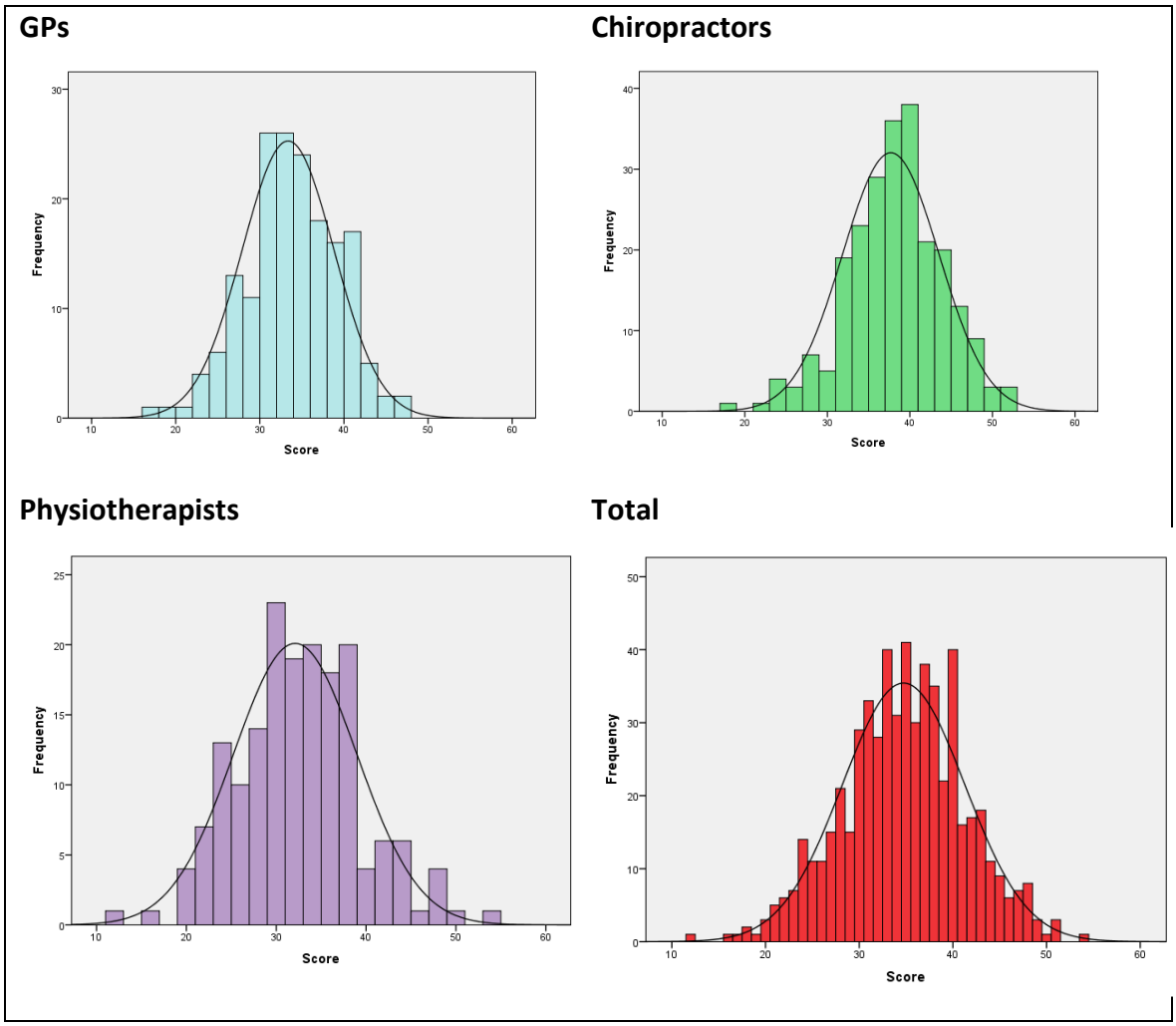


Figure 6.3 Distribution of scores on the existing biomedical scale

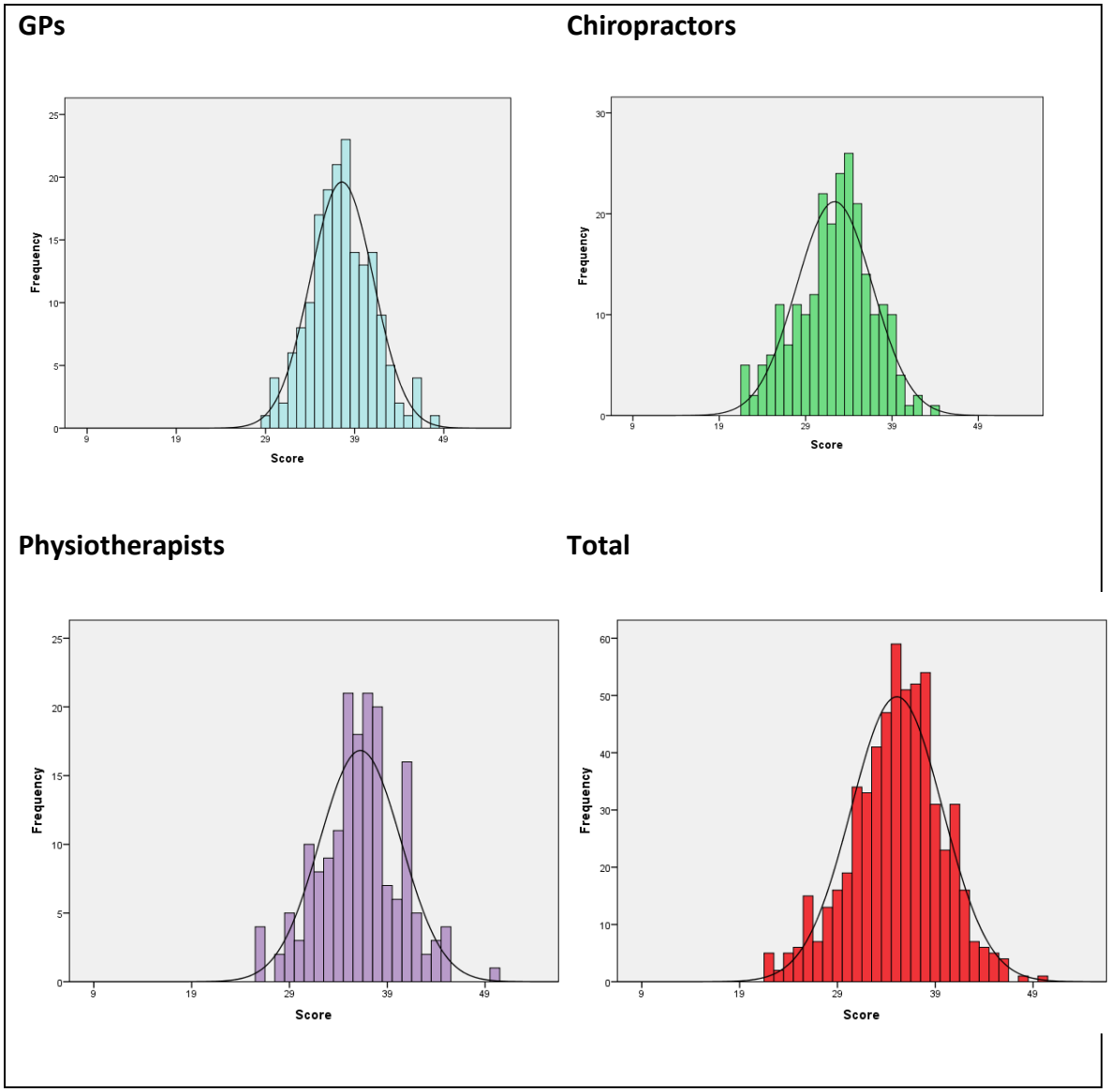


Figure 6.4 Distribution of scores on the existing biopsychosocial scale

6.6 Discussion

This chapter summarised the design and conduct of a national postal survey of GPs, chiropractors and physiotherapists' attitudes and beliefs about common MSK pain. The baseline survey was posted to 1999 HCPs and the retest survey was posted to 150 HCPs and resulted in 587 respondents (response rate=31%) in the baseline survey and 116

respondents in the retest survey (response rate=77.3%), which exceeded the sample sizes considered sufficient to conduct the planned factor and reliability analyses in chapters 7 and 8. Key findings arising from the conduct of the survey are discussed below.

6.6.1 Key findings

6.6.1.1 Response rate to the baseline survey

The response to the baseline component of this survey was low, with rates of 18.1%, 48.3% and 40.6% obtained for GPs, physiotherapists and chiropractors respectively. However, as modest response rates had been anticipated and considered in the design of the survey (as discussed in section 6.4.5.1) the number of responses required for the planned analyses outlined in section 6.4.5 was still achieved.

The modest expectations for response factored into the design of this survey, were informed by the recognition that response rates to surveys among HCPs are generally lower than for the general public (Asch et al. 1997; Cummings et al. 2001; Sudman 1985) and have been declining over time (Cho et al. 2013; Cull et al. 2005; McLeod et al. 2013). For example a meta-analysis of surveys of HCPs found that response rates had decreased from more than 80% prior to 1960 to around 50% in 2000 and down to 42% by 2012 (Cho et al. 2013). The overall response rate of 31% across all three groups in this survey was therefore considerably lower than the rates reported by Cho et al. (2013).

However, although the response rates for all three professional groups fell below those anticipated prior to conducting this survey, they were similar to those reported for other surveys of HCPs' attitudes and beliefs in the UK. The 40.6% response rate from physiotherapists falls within the reported range of 32% (Pincus et al. 2011) to 58% (Holden et al. 2009); and a 48.3% response rate from chiropractors is considerably better than for

other national surveys conducted in the UK (28% for Pincus et al. 2007); 32% for Pincus et al. 2011) and Australia (29% for Innes et al. 2015). In contrast, the response rate of GPs in this survey (18.1%) was lower than for previous surveys conducted in the UK (22% for Bishop et al. 2008; 20.1% - 21.8% Cottrell et al. 2015) and for an Irish survey (57% for Fullen et al. 2011). However the Irish survey also included a small financial goodwill token to promote responses (Fullen et al. 2011). For practical reasons, the current survey did not include incentives, but a recent meta-analysis of surveys of HCPs suggests that the addition of a financial incentive may have increased response rates by around 7-8% (Cho et al. 2013).

Texts on survey methods advise that response rates of 60% are desirable with the implication that the lower the response rate the less likely the sample is to be representative (Moser & Kalton 1985; Bowling 2009). The recognised decline in HCP participation in survey research (Cho et al. 2013) is therefore problematic and concerning for the research community. A number of consistently cited reasons suggested for dwindling HCP response to surveys include: lack of time, perceived lack of relevance or importance, an increasing number of requests to complete surveys and increasing patient and administrative workloads (Sudman 1985; Klabunde et al. 2012; Cunningham et al. 2015). All of these factors may have been influential in the non-response of the HCPs invited to participate in this survey. However, it is also possible that a number of additional features of this survey may have contributed to the response rates observed.

Lack of time is a universal problem for HCPs, and if a questionnaire is judged to be too long or of little interest, it is easy to see how its completion might not be prioritised above more pressing or engaging tasks. Recent Cochrane reviews have shown that response rates are

better for shorter questionnaires (Rolstad et al. 2011; Edwards et al. 2009). In the current investigation, the biopsychosocial item development process was undertaken mindful of the fact that an overly long survey instrument may be a deterrent for busy clinicians. However, it is possible that the total of 64 PABS items (19 old and 45 new) included was too onerous for some; especially for those who had little interest in the subject matter, or considered it unimportant. Survey topics which are of less interest to respondents have been shown to have significantly lower response rates than topics which are of greater interest (Edwards et al. 2009). As discussed in section 6.4.4 it was anticipated that most chiropractors and many, but not necessarily all, of the physiotherapists sampled would work with and/or have a particular interest in common MSK conditions; and this may have contributed to the greater response rates from these two groups compared with GPs. In contrast, although patients with MSK conditions make-up around 30% of GP caseload (Briggs et al. 2015), they may not be of particular interest to all GPs. Furthermore, members of all three groups may have felt that answering questions about their attitudes and beliefs was not something they were willing to do.

In addition to the influence of these more general issues, there are number of more specific factors which may also have contributed to the response to this survey. These may be particularly pertinent in the lower than expected response from GPs and the more promising rate from chiropractors.

Firstly, although the potential impact of conducting the survey in close proximity to Christmas and seasonal holidays was not overlooked, it may have affected individuals' ability to participate. In an attempt to avoid the most disrupted period of time at the end

of December, baseline mailings were completed before the end of November 2013 and retest questionnaires not sent until the New Year. However, the increased healthcare workload often associated with the winter months is not confined to the public holidays. It is quite feasible that all three professional groups, but especially the GPs, were busier than usual for a number of weeks before and after the Christmas period, or on leave themselves.

A second factor which may have influenced the likelihood of response is the source of each of the samples of HCPs, and what these might have meant to potential participants. Although it was clearly stated in the invitation letter that the survey was being conducted by researchers at the iPCHS at Keele University (see appendix 12), details of the organisation which had provided the contact details for each group were also included. As explained in section 6.4.4, the GP sample was obtained from Binley's, which is a commercial organisation; a fact which may have had some bearing on GPs' unwillingness to respond to the survey. In contrast, samples of chiropractors and physiotherapists were provided by the BCA and the AACP, a professional body and a special interest network respectively. It is possible that the cooperation and support of these organisations provided the survey with additional credibility or importance for these groups. Additionally, while the contact details provided in the samples of physiotherapists and chiropractors were a mixture of private and work addresses, those provided by Binley's were exclusively GP practice addresses. This increases the possibility that study packs sent to these addresses may have been screened-out by administrative staff, which has been suggested as potentially contributing to increasingly low responses from HCPs (Klabunde et al. 2012).

A further, unsolicited, difference in terms of the presentation, or endorsement, of the survey was introduced to the sample of the chiropractors by the BCA, who publicised the survey in its online newsletter. This was essentially to advise their membership about the BCA's support for, and legitimacy of, the study although it may also have compelled more chiropractors to respond than might otherwise have done so. This may have been influential in the chiropractors providing both the highest response rate of the three groups in this study, and a greater response than reported for similar surveys of this group (Pincus et al. 2007; Pincus et al. 2011; Innes et al. 2015).

Finally, medical doctors in particular (Abdulaziz et al. 2015) and physiotherapists increasingly are commonly surveyed HCP groups and the possibility of 'questionnaire fatigue' may well have been a contributing factor. Chiropractors are a comparatively less surveyed group and as a result may have been more willing to participate, especially when considered alongside the MSK focus of the study and the additional exposure the study received from the BCA.

6.6.1.2 Respondent characteristics and representativeness

One problem associated with low response rates is the increased likelihood of recruiting non-representative samples (Moser & Kalton 1985; Bowling 2009). Comparisons of the responders and non-responders in surveys of HCPs and general populations have shown that non-responders can differ significantly from responders in demographic characteristics, behaviours, attitudinal items and views (Armstrong & Ashworth 2000; Rindfuss et al. 2015). Non-representative samples are considered to be a potential problem for all surveys. However, it is arguable how much of a difference a non-representative

survey sample may have in this current investigation. A non-representative sample is unlikely to impact on the analytical procedures to be undertaken in chapters 7 and 8; except in minor ways which will be discussed in each of the forthcoming chapters, and therefore should not prevent meaningful analysis. The greatest concern is the extent to which the newly developed instruments can be utilised validly in the wider GP, chiropractor, physiotherapist or HCP populations. However, it is likely that the validity of this instrument will not be reliant on the findings of only this programme of research, but will be built up over time, in different HCP populations in a variety of future investigations. Exploration of non-response bias was not possible since only the names and addresses of non-responders were available. However, it is possible to compare baseline data for the constituent groups with national data produced by the professional bodies and other national surveys, to evaluate whether each sample in the current investigation can be considered representative of the wider population from which it is drawn.

With regard to gender, the proportion of female respondents of physiotherapists and chiropractors is similar to those of their respective populations. Fifty percent of registered chiropractors in 2015 were female which is similar to this investigation where 49.1% of chiropractors were female (GCC 2015). Data from the Health and Care Professions Council (HCPC) dating from 2016 indicates that around 78% of registered physiotherapists were female, which is also similar to the 79.2% of female physiotherapists who participated in the survey (HCPC 2016). However, on the 2016 list of Registered Medical Practitioners, the General Medical Council reports that 51.4% of GPs are female whereas only 38.8% of GPs in this investigation/GP respondents were females (GMC 2016), suggesting female GPs were under represented in the sample obtained. However, examination of baseline data

from the current investigation confirms that on the important attitudinal scales for the existing PABS there is minimal difference between female and male GPs {Biomedical scale: male GPs = 37.5 (3.5) v female GPs = 37.6 (3.6); Biopsychosocial scale: male GPs = 33.6 (5.7) v female GPs = 33.2 (4.8)}. Thus, female gender under-representation in this investigation has not altered the attitudinal responses markedly. In the absence of additional sociodemographic or attitudinal data additional inferences can be drawn from comparisons of respondent characteristics, demographics and PABS scores of the three professional groups to previous similar national surveys of HCPs' attitudes and beliefs.

PABS biomedical scale scores

Existing PABS biomedical scale scores for the GPs, Chiropractors and physiotherapists suggest that there are no substantially meaningful differences between the populations sampled in this investigation compared with those of previous recent studies. GPs in this investigation scored a mean of 33.4, whilst previous studies of medical practitioners score between 30.9 (Bishop et al. 2008) and 34.8 (Sit et al. 2015). Chiropractors in this investigation scored 37.7, whilst one previous study of Australian chiropractors scored 34.5 (Innes et al. 2015). Physiotherapists in this investigation scored 32.1, whilst seven previous studies of physiotherapists scored between 27.1 (Magalhaes et al. 2012) and 32.0 (Derghazarian & Simmonds 2011).

PABS biopsychosocial scale scores

Existing PABS biopsychosocial scale scores suggest that all three HCP groups in this investigation score slightly higher compared with those of previous recent studies. GPs in this investigation scored 37.6, whilst previous studies of medical practitioners score between 33.7 (Bishop et al. 2008) and 35.6 (Sit et al. 2015). Chiropractors in this

investigation scored 32.4, whilst one previous study of Australian chiropractors scored 31.4 (Innes et al. 2015). Physiotherapists in this investigation scored 36.2, whilst seven previous studies of physiotherapists scored between 20.6 (Dalkilinc et al. 2015) and 35.1 (Vonk et al. 2009). The biopsychosocial scores in the current investigation are slightly greater than those seen in previous surveys. It is possible that biopsychosocial scores amongst HCPs have increased over time, though there are insufficient studies of a comparable nature to be able to confirm this trend.

In summary, the data obtained are considered adequate for the purposes for which this study was intended; development and preliminary psychometric testing of a PABS-MSK for use with HCPs. Whilst there was a difference in gender split proportions in the GP respondents compared to the broader GP population, the similarity between male and female GPs' PABS scores indicates that under-representation of female GPs has not negatively affected the data obtained. However, it is possible that the responding sample could be different from wider populations of HCPs in ways that are unknown and therefore the possibility of non-response bias cannot be ruled out.

6.6.2 Strengths and limitations of the survey

6.6.2.1 Strengths

This survey was designed and conducted in accordance with the tailored design method (TDM) for surveys advocated by Dilman (1978 and 2007) and several other theoretical considerations to support the psychometric analysis of a proposed new generic-MSK version of the PABS. The inclusion of a mixed HCP sample ensures applicability to a range of HCP groups involved in the management of patients with MSK pain. Several key characteristics of the respondents are similar to those expected given national patterns

within these HCP groups and the survey was successful in terms of generating sufficient numbers for the analyses planned and described next in chapters 7 and 8. Therefore, the responses to the survey were felt to be suitable with which to derive a version of the PABS appropriate for use across the range of HCPs involved.

6.6.2.2 Limitations

Despite recognising the potential for low response rates from a survey of HCPs and incorporating strategies such as over sampling and reminder mailings to mitigate the impact of this, response rates to this survey were lower than expected. Potential factors which may have contributed to this were explored in section 6.6.1.1 above and included the effect of conducting the survey around the Christmas period, survey length, low relative interest in the topic of attitudes and beliefs and possible questionnaire fatigue.

Non-response bias is a problem for all researchers using survey methods (Danielsen et al. 2015). If responders differ in important ways from the non-responders then it is difficult to say how the entire sample would have responded, which can reduce the generalisability or applicability of the survey findings (Curtis & Redmond 2009). Many researchers have suggested that it is impossible to obtain accurate estimates of the effect of non-response bias and without sampling non-respondents it is not possible to say whether there were important differences between those who did and did not respond (Armstrong & Overton 1977). Despite several key characteristics of these survey respondents corresponding with national patterns for GPs, chiropractors and physiotherapists, the low response rate and unknown non-response bias means that it is not possible to determine whether the respondents or estimates derived from the survey differ from those who did not respond. However random-sampling of a comprehensive sample of GPs and chiropractors was

undertaken which increases the likelihood that respondents were representative of their respective source populations. This comprehensive sample was not available for physiotherapists and for pragmatic reasons a convenience sample was used, therefore it is possible that the physiotherapy data may not be representative of the broader population of UK physiotherapists.

6.6.3 Implications

The implications from this survey can be considered in terms of those which concern this scale development process in particular, and the more general implications for the future and role of HCP survey research in general.

6.6.3.1 General implications

The poor response rate achieved in this study corresponds with the well-recognised decline in response rates to surveys of HCPs and there is no reason to suspect that this trend is likely to reverse. The volume of research produced over the last 70 years has increased exponentially (Bornmann & Mutz 2015) with the implication that the burden on research participants has also increased exponentially. This, coupled with the increasing clinician burden due to busy clinical life and particularly NHS constraints, may further reduce willingness of NHS based HCPs to participate in surveys. This threatens not just the integrity and validity of future surveys, but also increases the difficulty of publishing surveys with what may be considered low response rates (Hardigan et al. 2016). Simply increasing sample sizes to meet statistical power requirements may not be the answer as the costs of doing so become prohibitive, leading to a greater number of requests to participate being sent to the same pool of HCPs, which further contributes to questionnaire fatigue, diminishing response rates and increases the likelihood of recruiting a non-representative

sample. New strategies, particularly aimed at GPs, need to be developed in order to maximise response rates, data quality and generalisability of research results (Cottrell et al. 2015).

One recruitment strategy already utilised by many investigators in the study of HCPs attitudes and beliefs is convenience sampling; for example, with participants recruited through known groups, following a training event or through Special Interest Group meetings (O'Sullivan 2012; O'Sullivan et al. 2013). This approach may be far more efficient, delivering greater rates of return for less work and money, but with the similar limitation to the current study that this may not deliver a representative sample. However, as the likelihood of getting a representative sample reduces with response rate (Moser & Kalton 1985; Bowling 2009) it may be that the recruitment of convenience samples and random samples become equivocal.

Current evidence from systematic reviews suggests that postal surveys are still likely to gain higher response rates compared with telephone, email, online or web-based surveys (Cho et al. 2013; Pit et al. 2014). There are limitations to all types of surveys, however utilising mixed-mode surveys may help to engage a broader, more representative sample (Koivula 2016).

6.6.3.2 Implications for this study

In spite of low response rates, this survey recruited the number of HCPs required for the planned analyses which comprise the remaining stages of the scale development process in this thesis. Since the measurement properties of an instrument are always unique to the samples in which it has been tested, further research will be required in different

populations of HCPs (de Vet et al. 2011; Streiner et al. 2015). However as far as it is possible to determine, the samples of GPs, chiropractors and physiotherapists were broadly similar to their wider UK populations (with the exception of fewer female GPs in the respondent pool than national proportions); and their attitudes and beliefs about MSK pain were comparable with those of similar samples in other surveys of HCPs attitudes and beliefs. Therefore, the responses to the survey were considered suitable for the purpose of development of the PABS-MSK for use across the range of HCPs involved.

6.7 Conclusions

This chapter summarised the design and conduct of a national postal survey of HCPs attitudes and beliefs about common MSK pain. Response rates were slightly lower than previous similar UK surveys, despite the incorporation of several strategies to optimise response in the design of the survey. However, the approach of oversampling yielded sufficient numbers of responses to the survey, in each HCP group, to conduct the planned factor and reliability analyses.

The next two chapters will present two stages of psychometric analysis utilising the data collected in this chapter. In chapter 7 the findings of initial item testing, scale development and structural validation procedures will be described and discussed. In chapter 8 the findings of test-retest reliability analyses will be presented.

Chapter 7: Development of a new generic musculoskeletal version of the Pain Attitudes and Beliefs Scale: Development, factor analysis and internal consistency

7.1 Chapter introduction

In chapter 2, the relative strengths of the biomedical scale and the limitations of the biopsychosocial scale of the existing PABS were identified. In addition, it was highlighted that the PABS was not developed with a broad range of HCPs or MSK conditions in mind. Thus, the recommendation was that a new generic scale for measuring HCP's attitudes and beliefs about common MSK pain was developed, and that a new biopsychosocial is developed to sit alongside the existing PABS biomedical scale in a redeveloped, generic MSK version of the PABS (the PABS-MSK).

This chapter describes the fifth and penultimate stage of this scale development process. The baseline data collected in chapter 6 were used to inform initial item testing, scale development and structural validation of the new measure. Comprehensive testing of items in this way is recommended (de Vet et al. 2011). Appendices 11 and 13 to 16 contain the supporting materials which are referenced within this chapter.

7.2 Aims and objectives

The aim of this study was to develop and undertake initial testing of a new measure of HCPs' attitudes and beliefs about common MSK pain i.e. the PABS-MSK. To achieve this aim the following objectives were addressed:

1. Examine the performance of the extended pool of biopsychosocial items presented in chapter 5 and identify those most appropriate for inclusion in a new biopsychosocial scale of the PABS-MSK
2. Test the structural validity and internal consistency of this new biopsychosocial scale

3. Confirm the structural validity and internal consistency of the existing biomedical scale of the current PABS

7.3 Theory overview

In chapter 2 (section 2.6) the principles underpinning the measurement of an unobservable construct, such as attitude, using a classical test theory (CTT) approach were introduced. For many authors in the field of measurement and psychometrics, the overarching principle throughout is construct validity (Cook & Beckman 2006; Simms 2008). Construct validity is defined as the degree to which the scores of a measurement instrument are consistent with hypotheses, based on the assumption that the instrument validly measures the target construct (Mokkink, Terwee, Patrick, et al. 2010). Such hypotheses may concern relationships within the scale or with scores of other instruments, or the difference in score between known groups (de Vet et al. 2011). The taxonomy generated by the COSMIN collaboration distinguishes three aspects of construct validity: structural validity, hypothesis testing and cross-cultural validity (Mokkink, Terwee, Patrick, et al. 2010). The latter two, hypothesis testing (which concerns the relationship of scores on the instrument with scores of other instruments or differences in the scores of relevant subgroups) and cross-cultural validity (which refers to the performance of items on a translated instrument compared to the original) were beyond the scope of the initial scale development process undertaken within this thesis and will therefore need to be the subject of future investigation. The focus of this chapter is on the structural validity of the new instrument, the PABS-MSK.

The COSMIN collaboration define structural validity as the degree to which the scores of a measurement instrument are an adequate reflection of the dimensionality of the construct

to be measured (Mokkink, Terwee, Patrick, et al. 2010). However, in addition to being a performance criterion, structural validity is also the principle which underpins the initial stages of the scale development process. In this context structural validity concerns the extent to which structural relations between test items manifest in their inter-item correlations (Loevinger 1957; Simms 2008). Item selection strategies should be designed to maximise structural fidelity, with the focus on creating relatively homogeneous scales that are reasonably distinct from one another (Simms 2008).

One of the most widely used tools for creating internally consistent scales within CTT is EFA. EFA uses inter-item correlations to determine if the covariation observed in a set of items can be explained by one or more underlying latent variables (Simms 2008; de Vet et al. 2011, Schmitt 2011). When used in the preliminary stages of scale development, EFA serves two purposes, first the exploration of the factor structure of the items and second to inform the reduction of items through the iterative identification and removal of those which make little or no contribution to the factors (de Vet et al. 2011).

There are a series of methodological decisions that have to be made in both the approach taken to the EFA and the criteria for the selection of items for the scale(s), which are discussed in full in the methods section below. However, integral to this process is the examination of the internal consistency of the items and provisional scale. Internal consistency, a property of reliability, is defined as the degree of interrelatedness among the items (Mokkink, Terwee, Patrick, et al. 2010) and indicates the extent to which items in a scale measure the same construct (de Vet et al. 2011). Methodological texts stress that internal consistency is not an indication of homogeneity, as items within a multidimensional pool may co-vary but still represent different dimensions (Schmitt 1996;

Streiner et al. 2015). However when included in the examination of structure, indices of internal consistency such as inter-item correlations, item-total correlations and Cronbach's alpha can facilitate the identification of items which contribute most to the precision of an instrument (Simms 2008). The methods employed in this analysis and the rationale for their choice are presented below.

7.4 Methods

7.4.1 Summary of study design

This initial stage of psychometric analyses was conducted on data collected in the nationwide survey of HCPs reported in chapter 6, to develop a new biopsychosocial scale and confirm the existing biomedical scale of the PABS for the new generic PABS-MSK. A series of analyses were completed in the following order. First, preliminary checks of the data were conducted to ensure their suitability for the planned factor analyses. Second, item testing and reduction of the extended pool of 54 biopsychosocial items (identified in chapter 5) were undertaken using EFA, in order to create a preliminary biopsychosocial scale. Finally, CFA and Cronbach's alpha were used to test the structural validity and internal consistency of both the new biopsychosocial scale and the existing biomedical scale.

7.4.2 Samples and sample size

Participants in this study were the 587 GPs, chiropractors and physiotherapists included in the survey reported previously in chapter 6. The sample inclusion and exclusion criteria were described in detail in section 6.4.4, the main criterion for inclusion being that participants should be a registered GP, chiropractor or physiotherapist, working in the UK, who had treated a patient with MSK pain in the preceding six months.

In order to conduct both EFA and CFA on the biopsychosocial items, the data were randomly split into two sub-samples. The sample sizes required for factor analysis have previously been discussed in chapter 6, section 6.4.5.1, where it was concluded that to meet the criteria recommended by Terwee et al. (2007), 378 responses would be required to conduct EFA on the full pool of 54 biopsychosocial items and a minimum sample of 200 was needed for CFA (Byrne, 2005, Terwee et al. 2007).

Therefore, the total sample was randomly divided into two independent sub-samples of 350 for the EFA, and 237 for the subsequent CFA of the biopsychosocial items. Random allocation guards against the introduction of systematic differences between the two sub-samples (Floyd & Widaman 1995) and was conducted using the 'random sample of cases function' in SPSS (version 21). The complete sample of 587 was used for the CFA of the existing biomedical items. For the purpose of examining internal consistency sample sizes of greater than 100 are considered to be adequate (Mokkink et al. 2012).

7.4.3 Pre-analysis data checks

The data for this study were collected using the baseline questionnaire described previously in chapter 6, section 6.4.6 and collated in Microsoft Access before being transferred to SPSS (version 21) and AMOS (version 21). A copy of the questionnaire is included in appendix 11.

Both EFA and CFA are based on the assumption that data are continuous and normally distributed (Tabachnick & Fidell 2007) and data need to exhibit a sufficient degree of inter-correlation to be considered suitable for EFA (Clark & Watson 1995). In addition to the adequacy of the sample size, the stability and meaning of any resultant factor solution is heavily dependent on the suitability of the data for factor analysis (Field 2009). The

following pre-analysis checks were therefore performed to ensure that the samples were suitable for analysis.

7.4.3.1 Sampling adequacy

The reliability of factor analysis may be influenced by sample size due to the increased fluctuation in correlation coefficients observed in small samples (Kline 1994; Field 2009). Therefore, in addition to observing the sampling recommendations concerning the ratio of subjects to items and minimum sample size described previously in chapter 6, section 6.2, the adequacy of the sample for EFA was also assessed with the Kaiser-Meyer-Olkin (KMO) measure (Kaiser 1974, cited in Pett et al. 2003). Values closer to one for the KMO are indicative of compact patterns of correlations within the data which should yield distinct and reliable factors (Field 2009). It is suggested that values below 0.5 are unacceptable, between 0.5 and 0.7 are mediocre and values above 0.7, 0.8 and 0.9 are good, great and superb respectively (Hutcheson & Sofroniou 1999). In addition to the KMO for the sample as a whole, the sampling adequacy of individual variables was also examined in the anti-image correlation matrix (which is included in appendix 13).

7.4.3.2 Missing data

The extent and pattern of missing data were also examined for both the EFA and CFA samples. Little's MCAR test (Little 1988) was performed to determine if data were missing completely at random (MCAR), in that the pattern is unpredictable and unrelated to the variables (Tabachnick & Fidell 2007). This is a chi-square test where a non-significant result supports the null hypothesis that the missing data are MCAR. In the EFA of the biopsychosocial items, cases with missing data were excluded listwise. As CFA in AMOS uses the full-information maximum likelihood (FIML) method for model estimation, missing

data were imputed for these analyses using expectation maximisation (EM). EM infers the value of the missing data from the likelihood of its value under the distribution of the partially missing data (Tabachnick & Fidell 2007) and requires that the pattern of missing data is either MCAR or missing at random (MAR) (Jamshidian 2009 in Hardy & Bryman 2009).

7.4.3.3 Level and distribution of data

Data collected from Likert-type scales such as the PABS are, by convention, often treated as continuous data (Tabachnick & Fidell 2007 p6). Floyd and Widaman (1995) also confirm that factor analyses are frequently performed successfully on item level Likert data.

While EFA operates with the assumption of univariate normality, the assumption of multivariate normality underlies CFA (Tabachnick & Fidell 2007; Byrne 2005). Multivariate normality exists when in addition to each variable exhibiting normal distribution, all linear combinations of the variables and the residuals of analysis are also normally distributed (Tabachnick & Fidell 2007). However, multivariate normality is difficult to establish and available tests are reported as being overly sensitive (Tabachnick & Fidell 2007). In practice, it is considered sufficient if all the included items are normally distributed (Byrne 2005). However both EFA and CFA are considered to be fairly robust to violations of the assumption of normality in large samples, provided those violations are not too severe; for example values of skewness exceeding 2 and kurtosis greater than 7 (Fabrigar et al. 1999).

The distribution of each item was examined graphically with histograms and Q-Q plots and statistically with the Kolmogorov-Smirnov (K-S) test (Altman et al. 2013). A non-significant result confirms that the distribution of the sample scores does not differ significantly from that of a normally distributed set of scores with the same mean and standard deviation

(Field 2009). As the K-S test is sensitive to sample size, the coefficients of skewness and kurtosis for each item were also examined (Ghasemi & Zahediasl 2012). Previous psychometric investigations of the PABS have used values of skewness and kurtosis of -1.5 to +1.5 as thresholds for the inclusion of items in EFA (Houben et al. 2005; Mutsaers et al. 2014). As the analyses in this study were also in the service of scale development and psychometric evaluation, and to provide parity with these earlier PABS studies, it was decided to adopt these thresholds; despite their being considerably more stringent than the more relaxed thresholds described above - which may be appropriate for different applications of factor analysis. Therefore items with values for skew and/or kurtosis outside the range ro -1.5 to +1.5 were excluded from the factor analyses.

In addition to examining item distribution for its suitability for factor analysis, the distribution, or spread, of responses for each item was also examined from the perspective of its potential utility as a discriminative and responsive measurement item. However, there are few agreed recommendations for items with multiple response options. In previous developmental work with the PABS, Houben et al. (2005) adopted the criterion of >70% of responses in extreme categories (1 and 2 or 5 and 6 combined) for the exclusion of an item from further analysis. However, given the early developmental stage of the new biopsychosocial items, it was decided that the stringency of this criterion might lead to the exclusion of items with the potential to be informative. Streiner et al (2015) suggest that even items with a substantial degree of skew may have some utility and should not be dismissed prematurely. Therefore, items were also excluded if they did not elicit responses in both halves of the 'disagree –agree' spectrum (disagreement options = 1, 2, 3; agreement options = 4, 5, 6).

7.4.3.4 Degree of correlation between items in the EFA sample

EFA requires a degree of inter-item correlation of sufficient magnitude to suggest that the items represent the same underlying dimension, but not so much that the items' unique variance cannot be determined (Clark & Watson 1995; Floyd & Widaman 1995). This can be assessed by examining either the size or significance of inter-item correlations in the correlation and significance matrices respectively. Conventionally, items demonstrating multiple inter-item correlations below 0.2 and those correlating at 0.9 or greater are considered potentially problematic (Floyd & Widaman 1995; Field 2009).

In addition, the inter-relatedness of the items was also evaluated with Bartlett's test of sphericity which tests the null hypothesis that the correlation matrix is an identity matrix, i.e. there is no correlation between the items (Pett et al. 2003). A significant result ($p<0.05$) therefore indicates a degree of inter-item correlation and confirms that the data are appropriate for factor analysis. The determinant of the correlation matrix was examined to confirm the absence of multicollinearity (where items are very highly correlated); based on the guide that the determinant should be greater than 0.0001 (Field 2009).

7.4.4 Exploratory factor analysis of the biopsychosocial items

An iterative approach was taken to the EFA with successive rounds of analyses leading to the step-wise identification and removal of less appropriate items. This approach meets the dual aims of factor analysis in scale development, to determine the underlying factor structure of the items and identify the items which best represent those factors (de Vet et al. 2011; Gorsuch, 1997). Three steps of EFA analysis were completed and are detailed below in section 7.4.4.3. In undertaking these steps three methodological components

were employed within EFA (section 7.4.4.1) utilising the agreed a priori criteria adopted for the removal of items (section 7.4.4.2). These are described next.

7.4.4.1 Methodological components

The three key methodological components within EFA are: 1) extraction of the factors, 2) determination of the number of factors to retain and 3) rotation of the factors (if required). There are several different approaches to each component, and while historically it has been accepted that there is no 'definitive' method of factor analysis (Ferguson & Cox 1993), there is increasing recognition that method selection should be transparent and appropriate for the aim(s) of the study and the characteristics of the data (de Vet et al. 2005). The justification for the method chosen for each component of this analysis is provided below.

Factor extraction

There are several different approaches to factor extraction, however maximum likelihood (ML) and principal axis factoring (PAF) are the most commonly used (Fabrigar et al. 1999). Conventionally, ML extraction is considered to provide the best results when data are normally distributed and principal axis factoring (PAF) will be more reliable when it is not (Osborne & Costello 2009). However, it has also been demonstrated that results generated by the two methods will vary dependent on other features of the data with PAF being preferred if there are few items per factor and ML being preferred in situations where items load unequally within factors (de Winter & Dodou 2012). Field (2009) also states that the choice of extraction method should be guided by whether the aim is to be inferential, in which case ML would be indicated, or descriptive, for which PAF is preferable. PAF was chosen as the preferred extraction method due to its greater reliability in data which are

not normally distributed and because any conclusion reached with regard to the factor structure of the new biopsychosocial items will be limited to the EFA sample.

Number of factors extracted

The main consideration in determining the number of factors to retain in the analysis is the theoretical coherence of the resultant factor structure (DeVellis 2012). However, additional considerations include ensuring there are sufficient factors retained so that items are not forced to load onto a factor they would not otherwise, but not so many factors that they contain too few items to remain stable. In addition, the retained factors need to explain a sufficient proportion of the total variance in the items (Fabrigar et al 1999; Reise et al 2000).

There are a number of statistical and non-statistical methods to determine the number of factors to retain, however two commonly employed approaches are the Kaiser criterion and the scree test (DeVellis 2012; Osborne & Costello 2009). In the Kaiser criterion all factors with an eigenvalue greater than one are retained. The eigenvalue is the standardised variance associated with a factor and represents the explanatory power of that factor (across all the items). A factor with an eigenvalue less than one explains less variance than a single item (Floyd & Widaman 1995), and therefore does not provide any additional explanatory power. However, it is largely recognised that the Kaiser criterion can overestimate the number of meaningful factors, especially in data with low inter-item correlations (Tabachnick & Fidell 2007; Gorsuch 1997).

The scree test uses the plot of eigenvalues (y-axis) against each (unrotated) factor. As successive factors are extracted from the residual shared variance, the scree plot produces a distinctive curve, with the first factors extracted accounting for the greatest proportion

of variance (Field 2009). The point of inflexion of the curve is used as a 'cut-off' for the number of factors to retain (Field 2009; Preacher & MacCallum 2003). It is not recommended that factor selection is based on the scree test alone (Field 2009), therefore the results of both the scree test and the Kaiser criterion were examined in conjunction with the factors' interpretability and coherence (DeVellis, 2012).

Factor rotation

In the final stage of factor analysis, the factor axes are rotated with the aim of achieving 'simple structure' and therefore improving the clarity, interpretability and replicability of the factor solution (Kline 1994; Pett et al. 2003). Simple structure is characterised by a pattern of loadings where the items load strongly on only one factor and have zero (or near zero) loadings on all other factors (DeVellis 2012; Pett et al. 2003). Rotation can be orthogonal, where the factor axes remain at 90^{o} to one another and therefore uncorrelated, or oblique, in which case the axes can move in relationship to one another, and therefore become correlated (Kline 1994).

Oblique rotation is recommended when the relationship between the factors is unknown, especially in the social sciences, where it is considered less usual for underlying latent variables to be unrelated (Pett et al. 2003). Oblique rotation allows factor axes to remain uncorrelated, if this is the relationship that exists between the factors (Gorsuch 1997). Given that the new biopsychosocial items were derived from a single conceptual framework, it would not have been unexpected for any factors subsequently extracted to be correlated. Furthermore, the relationship between the new and existing biopsychosocial items, which were both included in the analysis, was unknown and therefore direct oblimin - an oblique rotation - was employed. The degree of correlation

permitted between the factors (delta) was left at the default setting of 0 in SPSS. This is recommended practice in the absence of any compelling rationale for altering it (Osborne & Costello 2009).

7.4.4.2 Criteria for removal of items

One of the primary functions of EFA is to determine the number of factors which are needed to characterise an item pool (DeVellis 2012) and to identify items that do not contribute to the factors so that they can be removed from the item pool (de Vet et al. 2011). To identify the items which were contributing least to each factor solution, and would therefore be candidates for removal, item performance was assessed against two a priori criteria informed by recommendations within the literature.

The first criterion concerned the strength with which each item loaded on a factor and its communality. Recommendations vary about the size of factor loading that is considered meaningful, with some proposing 0.4 (Floyd & Widaman 1995; Stevens 2002) and others arguing that 0.5 is desirable (Nunnally & Bernstein 1994; Costello & Osborne 2005). To allow the behaviour of items to be monitored as the analysis evolved, the more conservative criterion of 0.4 was adopted for the first iterations of the analysis. However, the threshold for factor loading was increased to 0.5 in the later stages of analysis to allow greater refinement of the item pool. Communality is the amount of common variance in each item that is explained by all the extracted factors. Costello and Osborne (2009) suggest that items with communality of less than 0.4 may be candidates for removal. Therefore, the first criterion by which items were identified for potential removal was having a communality and factor loading of <0.4.

The second criterion for the potential removal of an item was if it 'cross-loaded' on more than one factor. Cross-loading items have been defined as items which load substantially, >0.32, on more than one factor (Tabachnick & Fidell 2007) and are considered problematic in the interpretation of the factor structure.

The application of these criteria for item performance is described further in the following section, which describes the step-wise analytic procedure employed.

7.4.4.3 The three steps of EFA analysis and interpretation

Step 1

The first iteration of the analysis included all the factorable, new and existing, biopsychosocial items. The Kaiser criterion and scree plot were examined to determine the number of factors that should be extracted in each of the subsequent iterations. The performance of each item was evaluated against the a priori criteria described, with the conservative threshold for factor loading of <0.4 being applied. Successive analyses were conducted which forced the most interpretable factor solutions identified in the first iteration and items meeting either of the criteria for removal in all factor solutions were removed from the next iteration of the analysis. Step 1 was complete when no further items met the criteria for removal.

Step 2

To enable greater refinement of the item pool, the threshold for factor loading within the exclusion criteria was increased to <0.5. Successive analyses continued as for step 1, with items then evaluated against the more stringent criteria. Step 2 was complete when once again, no further items were identified for removal.

Step 3

In this stage the emphasis shifted from the consideration of individual items, to the evaluation of potential scales. The substantive meaning of each of the extracted factors, and how these had evolved over successive iterations were examined and the most theoretically coherent factor solutions were pursued in a final round of analysis. For this, only the strongest items from each factor solution were included. Item factor loadings, explained variance and Cronbach's alpha were examined for each of the resultant solutions to inform the identification of the most statistically stable and theoretically coherent scale.

7.4.5 Internal consistency of the biomedical and biopsychosocial scales

Examination of the internal consistency of the biopsychosocial items began in preparation for EFA with the examination of the inter-item correlations described above. There are a number of means of examining the internal consistency of factors within the factor analytic process and of any existing or proposed scale. In step 3 of the iterative EFA, Cronbach's alpha was calculated for each of the most coherent factors and item-total correlations were calculated for the proposed scale by correlating the score of each item with the total score, less the score for that item (de Vet et al 2011). Values of alpha above 0.6, and preferably 0.7, are considered a well-accepted guideline, with values in excess of 0.9 indicating potential redundancy within a scale (de Vet et al 2011). Items with an item-total correlation of less than 0.3 may not contribute much to the discrimination of individuals on the construct under study (de Vet et al. 2011); although Streiner et al (2015) suggest the less stringent threshold of 0.2 for the removal of items.

Cronbach's alpha was calculated for each factor extracted at all stages of the EFA. Item-total correlation and value of alpha if item deleted were also calculated for each item in the final factor solution.

7.4.6 Confirmatory factor analysis of the existing biomedical and new biopsychosocial scales

CFA of the existing biomedical subscale was conducted with the full sample of respondents. The new biopsychosocial subscale developed from the EFA was tested in the second sub-sample created for the purpose of this cross-validation, as described in section 7.4.2. The pre-analytic checks and assumptions that pertain to CFA were explained in section 7.4.3.

In a similar way to EFA, CFA involves a series of analytical steps about which a number of methodological decisions are required, namely: model specification and estimation of parameters, evaluation of model fit and, if required, post-hoc model fitting. The methods employed to execute each of these steps in this analysis are summarised below.

7.4.6.1 Model specification and estimation of parameters

A single latent variable was specified as the hypothesised structure for the CFA of both scales. This decision was informed by the result of the preceding EFA of the biopsychosocial items and the observation that the existing PABS biomedical items have routinely factored together onto a single factor (Ostelo et al. 2003; Houben et al. 2005; Dalkilinc et al. 2015). This initial model is illustrated in figure 7.1.

The schematic path diagrams produced by the AMOS statistical programme use standardised geometric symbols to represent the components and parameters specified in each model. When specifying the model, one factor loading is constrained to one which serves to over-identify the model. This ensures that there are more known parameters in

the model than unknown, therefore allowing all other parameters to be freely estimated (Byrne 2010).

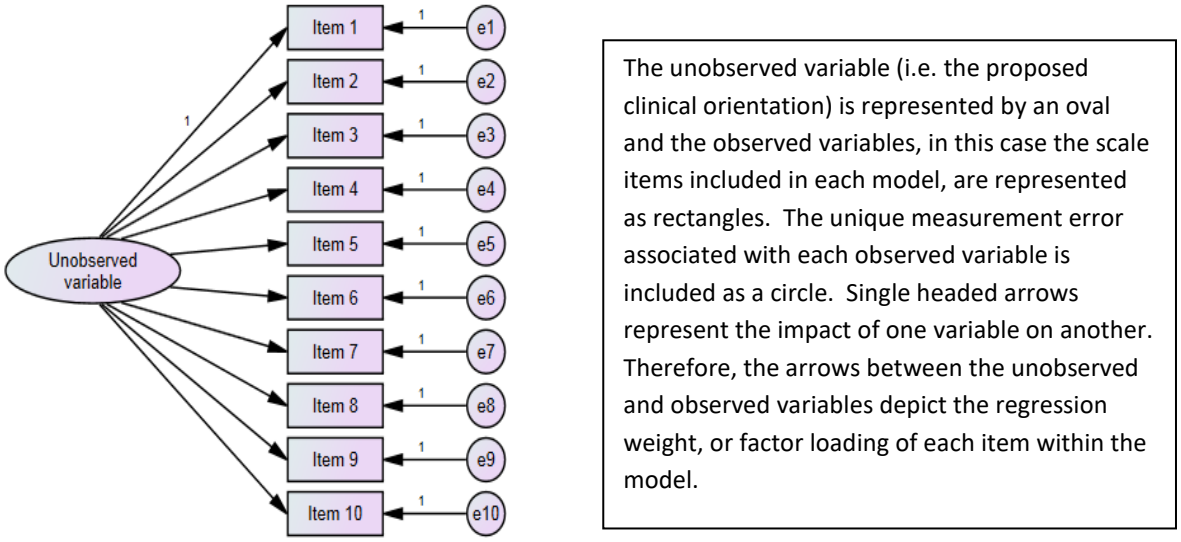


Figure 7.1: The initial single factor model proposed for both the existing biomedical scale and the new biopsychosocial scale

Having specified the model, analysis was conducted to estimate the model parameters. As for factor extraction in EFA, there are several estimation methods available. However, maximum likelihood (ML) estimation, which identifies the parameter values which make the observed data most likely, is the most commonly used, and was utilised in this analysis (Byrne 2005). To mitigate the effect of potential violations of the assumption of multivariate normality and to avoid overfitting the sample (Hair et al. 2006) bootstrapping with 2000 samples was employed.

7.4.6.2 Model fit

The next step was to assess the extent to which the specified model was consistent with the data. There are a number of fit indices and evaluation criteria proposed in the literature (Byrne 2005) and many of these are available in AMOS. However, as each of the indices

has their relative merits, there is also considerable debate about which index, or indices are most appropriate (Matsunaga 2011).

One of the most simple and conventional approaches available is to determine the absolute 'fit' between the covariance matrices of the sample and the estimated population. This is achieved with the Chi-square (x^2) statistic. However, the use of this statistic alone is not recommended due to its sensitivity to sample size (Tabachnick & Fidell 2007). For example, in large samples it is quite possible for the x^2 statistic to be significant, despite other indices indicating a good model fit (Matsunaga 2011). To mitigate the effect of sample size, the ratio of x^2 to degrees of freedom (df) has been suggested as an alternative (Kline 1994), with a ratio of 2 or less being considered acceptable (Tabachnick & Fidell 2007). However, it is generally recommended to use a number of different fit indices (Byrne 2005).

There are numerous different approaches to model fit, with indices of comparative fit, proportion of variance accounted, degree of parsimony fit and residual-based fit. It has been observed that in many cases, a well-fitting model will produce consistent results across different indices and that deciding which indices to report, therefore, is largely a matter of preference (Tabachnick & Fidell 2007). However, in highly cited guidance concerning choice of fit indices for CFA, Hu and Bentler (1999) recommend the use of the standardised root mean square residual (SRMR, <0.8), a residual-based fit index; and a comparative fit index (Hu & Bentler 1999). Of these, the comparative fit index (CFI) (Bentler 1990) and the root mean square error of approximation (RMSEA) (Browne & Cudeck 1992) are the most frequently reported. Values greater than 0.95 for the CFI and less than 0.06 for the RMSEA are considered indicative of good model fit (Tabachnick & Fidell 2007; Fabrigar et al. 1999). The models for each scale were therefore evaluated against the

following fit indices: x^2/df (in AMOS this appears as CMIN/df) <2, SRMR < 0.08, CFI >0.95 and RMSEA <0.06.

7.4.6.3 Post hoc model fitting

It is not unusual in CFA for the initial specification of the model to fail to provide an adequate fit to the data. In this situation, modifications can be made to the model to allow estimates for parameters that were previously fixed (to zero or one), or to add parameters to the model, for example covariance between error terms (Campbell et al. 2013). To identify parameters that should be re-specified, the reductions in x^2 that would result, known as the modification indices (MI) were examined (Byrne 2005). For a modification to be included in the model, it had to meet two criteria: 1) it had to represent a theoretically coherent and justifiable change to the model; and 2) it had to provide a significant improvement to the model fit, evidenced by a substantial reduction in the x^2 value (Campbell et al. 2013; Byrne 2005).

7.5 Results

7.5.1 Study population

Data from 587 GPs, chiropractors and physiotherapists were obtained in the national survey reported in chapter 6 and included in this analysis. The biopsychosocial item data were randomly divided into sub-samples of 350 and 237 cases for the EFA and CFA respectively.

7.5.2 Pre-analysis checks for the EFA

Sampling adequacy for all factorable items as determined by the KMO measure was 0.857, which is greater than the minimum 0.5 required, and close to the 0.9 considered indicative of excellent sampling adequacy (Field 2009) (see section 7.4.3.1). All item-level values on

the diagonal of the anti-image matrix were also in excess of 0.5. These findings indicate that the sample for the EFA of biopsychosocial items was adequate.

Seventeen of the 54 items included in the first iteration of the EFA had missing data. However, the largest number of missing responses for an item was five (1.4%). Little's MCAR test was non-significant ($\chi 2 = 717.439$, df = 713, p = .446) confirming these responses were MCAR. Consequently, none of the items were excluded on the basis of missing data.

Degree of correlation between items in the sample is presented in the correlation matrix shown in appendix 13. Examination of the matrix revealed generally low inter-item correlations, with the highest single correlation being 0.602 (between item 15 and 21). However, Bartlett's test of sphericity was significant (chi square = 3343.213, df = 666, $p<0.001$) suggesting that the degree of correlation between the items was sufficient for factor analysis. The determinant, although low at 0.0000155 was greater than the threshold value of 0.00001. Therefore, all remaining items demonstrated a sufficient degree of inter-correlation and none were excluded due to multi-collinearity.

The K-S tests for all 54 biopsychosocial items in this sub-sample returned significant results, and although the test is sensitive to sample size (Ghasemi & Zahediasl 2012),

Table 7.1 Candidate biopsychosocial items excluded prior to EFA

No.	Item	Missing data	Mean (SD)	Skew	Kurtosis	Responses in both 'halves' of scale	Reason for exclusion
12	Successful return to work depends on a patient's perception of the link between their job and their symptoms	0	4.8 (0.8)	-0.8	1.6	Yes	Kurtosis > 1.5
13	A clinician must know what resources are available in the community to support self-management	0	4.9 (0.9)	-0.8	1.6	Yes	Kurtosis > 1.5
16	A patient with low motivation to engage in treatment will have a poor outcome	0	5.2 (0.8)	-1.3	2.6	Yes	Kurtosis > 1.5
24	Patients' understanding about their pain should be considered	6	5.3 (0.7)	-0.8	1.8	Yes	Kurtosis > 1.5
27	Good listening skills are essential in the clinical management of patients	2	5.8 (0.5)	-1.4	0.7	No	No responses in 'disagreement' half of Likert scale (options 1, 2 or 3)
31	Clinicians must tailor information to the patient's ability to understand	1	5.7 (0.6)	-1.4	0.9	No	No responses in 'disagreement' half of Likert scale (options 1, 2 or 3)
34	Good clinician communication can increase the effectiveness of an intervention	1	5.7 (0.5)	-1.0	-0.2	No	No responses in 'disagreement' half of Likert scale (options 1, 2 or 3)
35*	Mental stress can cause pain even in the absence of tissue damage	0	5.2 (0.9)	-1.3	2.4	Yes	Kurtosis > 1.5
38	Anxiety and depression are key factors to consider when treating patients with pain	1	5.4 (0.7)	-1.1	1.7	Yes	Kurtosis > 1.5
45	The experience of pain is multi-factorial	0	5.6 (0.6)	-2.3	9.3	Yes	Kurtosis > 1.5, skew < -1.5
47	Signs and symptoms that indicate serious pathology must be identified	0	5.9 (0.5)	-5.2	38.2	Yes	Kurtosis > 1.5, skew < -1.5

48	A patient's emotional state impacts on their pain	2	5.5 (0.6)	-0.7	-0.5	No	No responses in 'disagreement' half of Likert scale (options 1, 2 or 3)
52	Other symptoms or health problems have an impact on pain	1	5.1 (0.6)	-0.1	-0.6	No	No responses in 'disagreement' half of Likert scale (options 1, 2 or 3)
53	Patients' thoughts, attitudes and feelings influence their pain	0	5.4 (0.6)	-0.6	-0.6	No	No responses in 'disagreement' half of Likert scale (options 1, 2 or 3)
54	The information needs of a patient must be met	1	5.4 (0.6)	-0.6	-0.6	No	No responses in 'disagreement' half of Likert scale (options 1, 2 or 3)
55	A patient's current level of physical function should be considered in the management of their pain	0	5.3 (0.6)	-0.9	2.8	Yes	Kurtosis > 1.5
61	I adapt my treatment to what I believe will be the most effective for each individual patient	2	5.5 (0.7)	-1.3	2.0	Yes	Kurtosis > 1.5

Note: SD=standard deviation, *=existing PABS item

examination of the histograms and probability plots confirmed distribution may be problematic for a number of items. Ten items (nine new and one existing PABS item) had coefficients of kurtosis or skewness outside the criteria thresholds for skewness and kurtosis of -1.5 to +1.5 (Houben et al. 2005; Mutsaers et al. 2014) (see section 7.4.3.3) and were therefore excluded from further analysis. A further seven items were excluded as they elicited no responses in the 'disagree' half of the Likert scale (options 1, 2 or 3), and therefore failed to meet the criteria for adequate response distribution. The 17 excluded items are detailed in table 7.1 and the remaining 37 biopsychosocial items retained for use in the EFA are listed in appendix 14.

7.5.3 EFA of biopsychosocial items

7.5.3.1 Stage 1: The initial 37-item analysis and determination of number of factors to be extracted

In this first iteration of the analysis 11 factors were extracted with an initial eigenvalue >1, although only three of these retained an eigenvalue greater than one after extraction. Extracted values are less than the initial eigenvalue as they are based on the common, rather than total variance within the items. On rotation, the variance is redistributed over the 11 factors initially extracted. The initial unrotated and rotated extracted eigenvalues/sums of squared loadings and the explained variance for these 11 factors are detailed in table 7.2.

Table 7.2: Initial factor extraction, eigenvalues and explained variance

Factor	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total
1	7.713	20.847	20.847	7.209	19.484	19.484	3.902
2	2.895	7.824	28.671	2.317	6.262	25.746	1.727
3	1.909	5.159	33.830	1.354	3.659	29.405	3.101
4	1.474	3.985	37.815	.973	2.629	32.034	3.657
5	1.348	3.642	41.457	.801	2.166	34.200	2.392
6	1.326	3.585	45.042	.731	1.975	36.175	1.049
7	1.222	3.304	48.346	.656	1.773	37.948	1.620
8	1.142	3.086	51.432	.556	1.502	39.450	2.399
9	1.086	2.936	54.368	.512	1.384	40.835	1.792
10	1.029	2.781	57.149	.452	1.221	42.055	3.378
11	1.024	2.767	59.916	.434	1.172	43.227	1.823

On further examination, five of the 11 factors contained less than three items, making them unlikely to be stable factors (Costello & Osborne 2005). Furthermore, the 11 factor solution had little, if any, theoretical coherence. The scree plot produced from this analysis is displayed in figure 7.2. This plot has a very steep gradient between the first two factors, illustrating the discrepancy between the eigenvalues of the first and second factors. The scree plot was interpreted as suggestive of three or two factors and given the large amount of variance explained by the first factor (relative to subsequent factors), a feasible single factor solution could also not be discounted. Therefore, a number of alternative factor solutions were explored; and single, two and three factor solutions were forced in each of the subsequent stage 1 and 2 analyses.

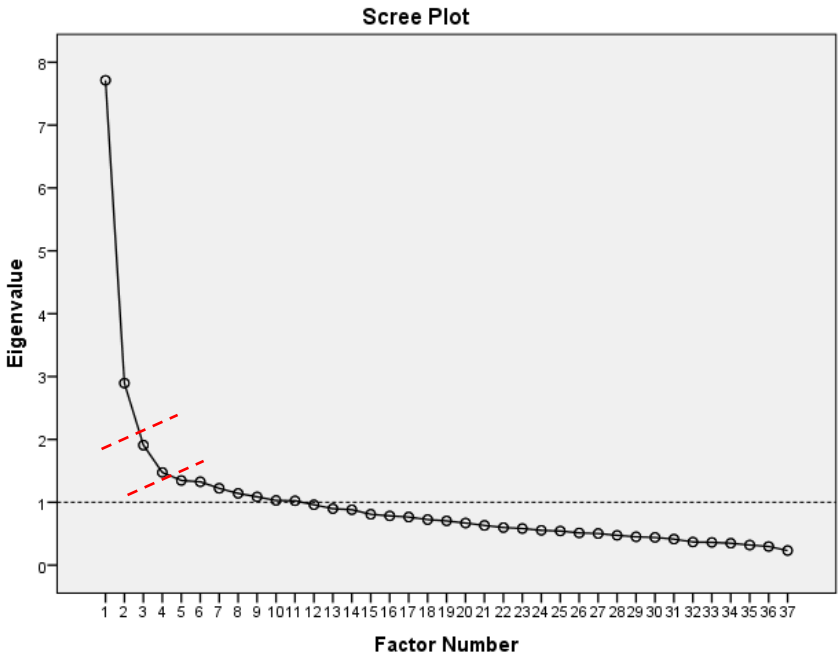


Figure 7.2: Scree plot from the initial 37-item analysis

7.5.3.2 Stage 1 and 2: Iterative analyses and item removal

In stage 1 and 2 of the analysis (which were described previously in sections 7.4.4.2 and 7.4.4.3) successive rounds of EFA were conducted, with evaluation of item performance for each iteration. Items meeting one of the criteria for removal in all factor solutions were removed from the subsequent round of analysis. This continued until no further items were identified for removal with the increased threshold for factor loading introduced in stage 2. The flowchart in 7.3 summarises this process and the items removed at each stage.

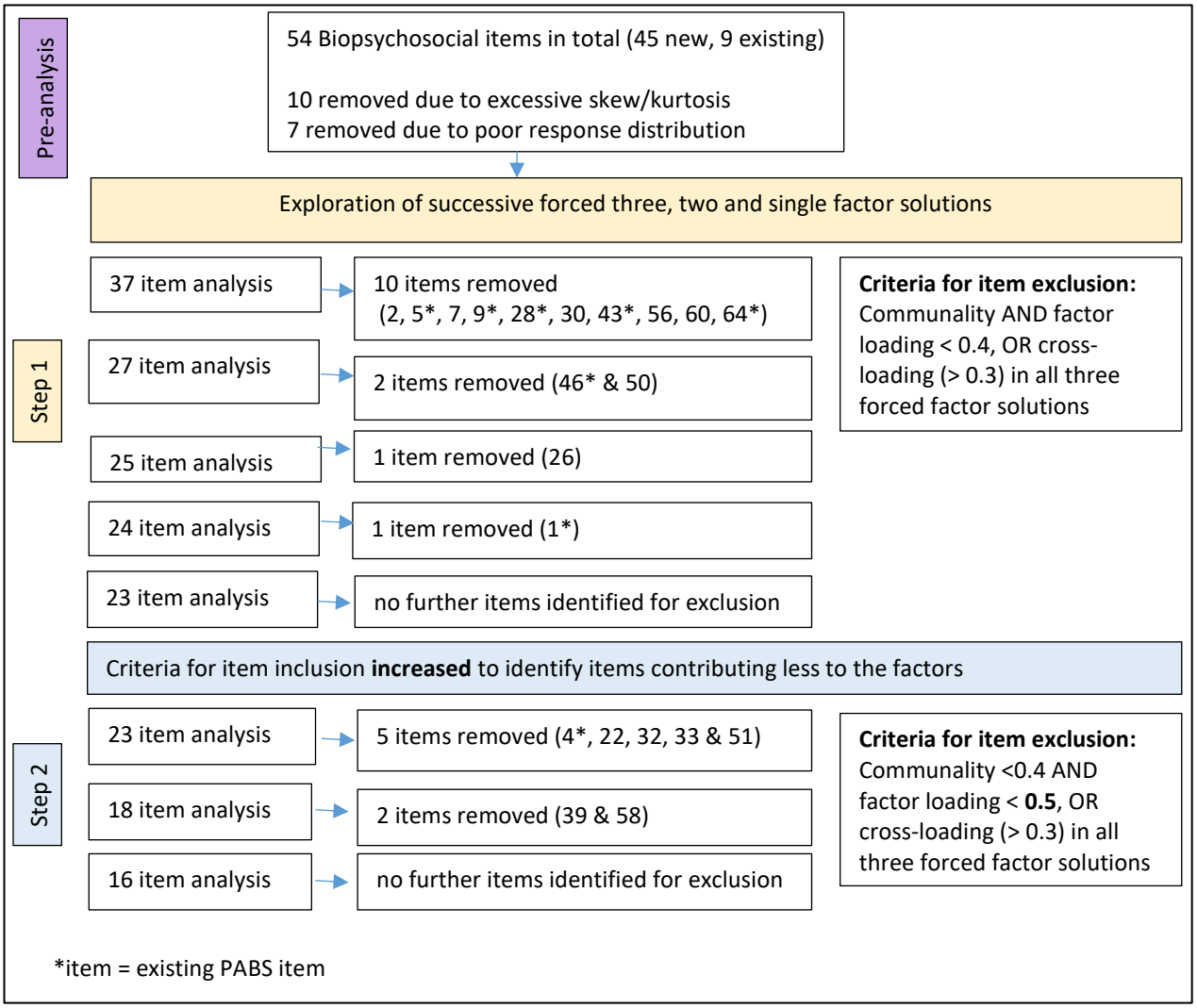


Figure 7.3: Summary of stages 1 and 2 of the iterative factor analysis and item reduction process

7.5.3.3 Stage 3: Evaluation of theoretically coherent factor solutions

Across all iterations of the analysis in stages 1 and 2, the three-factor solution provided the least coherent structure and a somewhat artificial division of the items. Initially, the three factors appeared to broadly represent: 1) Aspects of 'patient centred' clinical assessment and management (e.g. item 08 "*the patient must always be involved in setting the goals of treatment"*); 2) more specific, clinically framed, behavioural issues (e.g. item 62 *"I routinely assess how confident my patients are in their ability to manage their pain"*); and 3) aspects of outcome, recovery and response (e.g. item 57 *"Patients' expectations of the future affect their outcome"*). However, as items were eliminated the first grouping became less distinct, while the other two groups remained clear. It was therefore decided that three factors was not a theoretically coherent or stable representation of the items and further iterations of the three factor solution were not pursued in this third and final stage of analysis. Factor loading tables for the three-factor solution during an early iteration of the analysis (25 items) and the final iteration of stage 2 (16 items) are included in appendix 15 for information.

The two-factor solution provided a similar distinction between the outcome/response items and the more clinically oriented items throughout the analysis. This second grouping was a combination of the clinical assessment/management and the clinical behaviour items that were differentiated (as factors 1 and 2) in the earlier three factor solutions. This factor structure remained relatively stable as the analyses proceeded and items were gradually removed. The two-factor solution was therefore included in the final stage of the analysis, as was a single-factor solution which had remained coherent throughout the analyses.

As described in section 7.4.4.3, the purpose of this final stage was to pursue and compare the strongest items in the most theoretically coherent factor solutions. Therefore, a final

round of analysis was conducted using the items with the highest factor loadings in the single and two-factor solutions from the final 16-item iteration (see figure 7.3 and appendix 15). The forced single factor solution included 11 items with a factor loading of >0.5 which were taken forward as the first pool of items. However, in the two-factor solution only eight items loaded >0.5, which were considered unlikely to yield a stable two-factor solution. Therefore, an additional four items with factor loadings of >0.4 were also included in the pool of the 12 strongest items from the previous two-factor solution.

The final two analyses were therefore performed on the 11 and 12 strongest items from the previous single-factor and two-factor solutions respectively. To enable comparison of any conceptual change introduced with the differential item selection, both a two and a single factor solution were also forced in each pool of items. Tables 7.3a and b detail the resultant factor solutions.

Table 7.3a: Items included and results of the final 12-item analysis

			Two factors		Single factor	
Item no	**Item**	**Com.**	**1st F/L**	**2nd F/L**	**Com.**	**F/L**
14	The way in which a patient currently copes with their pain must be assessed	0.332	**0.472**	0.175	0.338	**0.581**
15	The reaction of a patient's family and friends will promote recovery	0.489	**0.714**	-0.032	0.398	**0.631**
17	A patient's beliefs about the cause of their pain must be understood	0.445	**0.507**	0.254	0.460	**0.678**
20	A patient's perceived barriers to work must be assessed	0.451	**0.566**	0.180	0.454	**0.674**
21	Family and friends have an effect on a patient's pain	0.531	**0.781**	-0.126	0.371	**0.609**
23	Patients' expectations of treatment affect their outcome	0.342	**0.604**	-0.044	0.276	**0.525**
57	Patients' expectations of the future affect their outcome	0.278	**0.534**	-0.014	0.235	**0.484**
08	The patient must always be involved in setting the goals of treatment	0.131	0.077	**0.319**	0.102	**0.319**
37	I always take time to provide an explanation about the patient's pain	0.474	-0.127	**0.741**	0.175	**0.419**
42	A patient's physical activity level should be considered in the management of their pain	0.333	0.283	**0.385**	0.315	**0.561**
62	I routinely assess how confident my patients are in their ability to manage their pain	0.414	-0.004	**0.645**	0.220	**0.469**
63	I always assess the impact of a patient's pain on their ability to work	0.400	0.054	**0.605**	0.246	**0.496**
Eigenvalue – extraction (rotated)			*3.662 (3.294)*	*0.958 (2.565)*		*3.589*
Explained variance (%)			*30.519*	*7.984*		*29.906*
Cronbach's alpha			*0.816*	*0.693*		*0.824*
Factor correlation			*0.481*			

Table 7.3b: Items included and results of the final 11-item analysis

			Two factors			Single factor
Item no	**Item**	**Com.**	**1st F/L**	**2nd F/L**	**Com.**	**F/L**
11	Biological, psychological and social factors should all be included in the clinical assessment	0.312	**0.559**	0.001	0.279	**0.528**
14	The way in which a patient currently copes with their pain must be assessed	0.344	**0.382**	-0.264	0.350	**0.592**
17	A patient's beliefs about the cause of their pain must be understood	0.521	**0.715**	-0.011	0.466	**0.683**
18	Specific and realistic goals for treatment must be agreed with the patient	0.369	**0.699**	0.166	0.262	**0.512**
20	A patient's perceived barriers to work must be assessed	0.525	**0.612**	-0.161	0.520	**0.721**
23	Patients' expectations of treatment affect their outcome	0.265	**0.318**	-0.252	0.268	**0.518**
42	A patient's physical activity level should be considered in the management of their pain	0.290	**0.447**	-0.129	0.290	**0.539**
59	It is essential to reduce a patient's fear about their pain	0.242	**0.448**	-0.065	0.232	**0.482**
15	The reaction of a patient's family and friends will promote recovery	0.572	0.094	**-0.694**	0.430	**0.656**
21	Family and friends have an effect on a patient's pain	0.641	-0.025	**-0.816**	0.398	**0.631**
41	I consider a patient's social support network in my clinical management	0.265	0.269	**-0.300**	0.264	**0.513**
Eigenvalue – extraction (rotated)			*3.820 (3.478)*	*0.526 (2.895)*		*3.759*
Explained variance (%)			*34.731*	*4.780*		*34.175*
Cronbach's alpha			*0.803*	*0.701*		*0.845*
Factor correlation			*0.632*			

The analysis of the 12-item pool (table 7.3a) resulted in a marginally more viable two-factor solution than in the pool of 11 items; although the second factor only contained three items loading > 0.4. The 11-item analysis (table 7.3b) produced a more robust single factor than two-factor solution, with a general trend of improved factor loadings. The 11-item version of the single factor solution also had a greater eigenvalue, explained variance and Cronbach's alpha than the 12-item version and was in fact the strongest factor solution produced in this final stage of analysis. Although the 11 and 12-item versions had seven items in common, differences were observed in the content and meaning of the resultant

factor solutions. There was also an increase in the correlation between the two factors in the 11-item version, with the value of 0.632 the highest factor correlation observed in all stages of the analysis.

Having pursued both the two and single factor solutions to their statistical conclusion, the single factor solution was identified as the strongest representation of the biopsychosocial items. This factor was therefore proposed and tested as the new biopsychosocial clinical orientation scale for the PABS-MSK, and will be described as such in the remainder of the thesis.

7.5.4 Internal consistency of the existing biomedical and new biopsychosocial scales

Cronbach's alpha for the new 11-item scale was 0.845 and therefore well in excess of the 0.7 considered to be acceptable (Streiner et al. 2015). The internal consistency statistics for each of these 11 items are presented in table 7.4.

The item-total correlation for all items exceeded the more stringent minimum of 0.3 advocated by de Vet et al (2011). The values of Cronbach's alpha if item deleted demonstrated that alpha would not be substantially affected by the removal of any one of the 11 items. It was observed that items 15 and 21 were conceptually similar and their performance in the EFA had also been comparable, which raised the possibility of removing one of these two items to provide a more parsimonious scale. Item 21 was elected for removal on the basis that it had a marginally lower factor loading. Cronbach's alpha for the 10-item scale was 0.828. Summary descriptive statistics for the 10-item biopsychosocial clinical orientation scale are provided in table 7.5.

The internal consistency of the existing biomedical subscale was also explored in the full sample of 587 respondents, where Cronbach's alpha was 0.782.

Table 7.4 Internal consistency statistics of the 11 items in the final single factor solution

No.	Item	Item-Total Correlation	Alpha if Item Deleted
11	Biological, psychological and social factors should all be included in the clinical assessment	.481	.836
14	The way in which a patient currently copes with their pain must be assessed	.541	.831
17	A patient's beliefs about the cause of their pain must be understood	.619	.825
18	Specific and realistic goals for treatment must be agreed with the patient	.460	.838
20	A patient's perceived barriers to work must be assessed	.653	.822
23	Patients' expectations of treatment affect their outcome	.469	.837
42	A patient's physical activity level should be considered in the management of their pain	.505	.834
59	It is essential to reduce a patient's fear about their pain	.435	.839
15	The reaction of a patient's family and friends will promote recovery	.605	.826
21	Family and friends have an effect on a patient's pain	.581	.828
41	I consider a patient's social support network in my clinical management	.472	.840

Table 7.5 Summary descriptive statistics for the new 10-item biopsychosocial clinical orientation scale of the PABS-MSK

	New biopsychosocial scale (scale 10-60)
Mean	51.73
Standard deviation	4.48
Variance	20.11

7.5.5 Pre-analysis checks for the CFA

The 10 biomedical and 10 biopsychosocial items subjected to CFA and their descriptive statistics are detailed in table 7.6.

7.5.5.1 Sample of 537 for CFA of the 10 existing biomedical items

The K-S tests for all the biomedical items were also significant, although the histograms and probability plots were indicative of a normal distribution of responses. Furthermore, nine of the ten items had coefficients for skewness and kurtosis which fell within the threshold of -1.5 to +1.5 adopted for this study (see section 7.4.3.3). The coefficient of kurtosis for

item 19 was 1.955, however the item was retained in the CFA of the biomedical items for three reasons. Firstly, as advocated by Tabachnik and Fidell (2007), the structure of the biomedical items was being tested as an established scale, and as such it was desirable to include all the items in that scale. Secondly the thresholds adopted for skewness and kurtosis were informed by developmental studies using EFA and suggested thresholds for kurtosis in CFA range from 10 to 20 in the literature (Tabachnick & Fidell 2007). Finally, the sample size exceeded the generally accepted ratio of 15 items to each parameter estimated in the model which is considered to minimise problems associated with deviations from normality (Hair et al. 2006).

The number of missing responses for items in this sample was again small, with a maximum of seven (1.2%). Little's MCAR was non-significant (χ^2 = 134.054, df = 128, p = .339), therefore allowing imputation of missing data with expectation maximisation (EM). In summary pre-analysis checks confirmed that the data acquired from this sample was appropriate for use in CFA.

7.5.5.2 Sample of 237 for the CFA of the biopsychosocial items

In this sub-sample, the ten biopsychosocial items which were eventually taken forward for CFA (see table 7.6) again returned significant results for the K-S test. However, in this instance examination of the histograms and probability plots also indicated non-normal response distributions for several of these items. In addition, three items (11, 14 and 23) for which skewness and kurtosis had fallen within the threshold of -1.5 to +1.5 in the EFA sample, had coefficients of kurtosis>1.5 in this sample (3.359, 1.826 and 1.863 respectively). However, it was decided to proceed with all ten items in the analysis for two reasons. Firstly, these values of kurtosis still fell within the more conservative thresholds

described in the CFA and structural equation modelling literature (Fabrigar et al. 1999; Tabachnick & Fidell 2007) and bootstrapping was performed to mitigate the effect of deviations from normality.

Only 5 of the 10 items had any missing values and of these only a single item had two missing responses and the other four had just a single missing response. However, in this sample Little's MCAR test was significant (χ^2=64.787, df=45, p=0.028) indicating that these data were either MAR or not MAR (NMAR). However, although EM can be conducted on data that is MAR, there is currently no test available to distinguish between these two patterns (Garson 2015). Although the number of missing values is very small, the potential that it might be NMAR and the non-normal distribution of data for some items require the results of this analysis be interpreted with a degree of caution.

Table 7.6 Items included in CFA

No.	Item	Missing Cases	Mean (SD)	Skewness	Kurtosis	Responses in both 'halves' of scale
Biomedical CFA items (in sample of 587)						
3	Pain reduction is a precondition for the restoration of normal functioning	3	4.27 (1.13)	-0.75	0.19	Yes
6	If patients complain of pain during exercise, I worry that damage is being caused	6	2.89 (1.14)	0.21	-0.87	Yes
10	Increased pain indicates new tissue damage or the spread of existing damage	7	2.86 (1.11)	0.30	-0.47	Yes
19	In the long run, patients with musculoskeletal pain have a higher risk of developing functional impairments	1	4.85 (0.93)	-1.01	**1.95**	Yes
25	Patients with musculoskeletal pain should preferably practice only pain free movements	2	2.91 (1.07)	0.29	-0.32	Yes
29	If therapy does not result in a reduction in musculoskeletal pain, there is a high risk of severe restrictions in the long term	5	3.76 (1.06)	-0.35	-0.15	Yes
36	Pain is a nociceptive stimulus, indicating tissue damage	4	3.48 (1.26)	-0.23	-0.66	Yes

40	If musculoskeletal pain increases in severity, I immediately adjust the intensity of my treatment accordingly	4	4.28 (1.10)	-0.40	-0.01	Yes
44	The severity of tissue damage determines the level of pain	6	2.62 (1.21)	0.46	-0.43	Yes
49	Musculoskeletal pain indicates the presence of organic injury	6	3.01 (1.17)	-0.01	-0.63	Yes
Biopsychosocial CFA items (in sample of 237)						
11	Biological, psychological and social factors should be included in the clinical assessment	0	5.54 (0.63)	-1.46	**3.36**	Yes
14	How a patient currently copes with their pain problem must be assessed	0	5.25 (0.76)	-1.04	**1.83**	Yes
15	The reaction of a patient's family and friends will promote recovery	1	4.97 (0.84)	-0.37	-0.41	Yes
17	A patient's beliefs about the cause of their musculoskeletal pain must be understood	1	5.24 (0.71)	-0.53	-0.32	Yes
18	Specific and realistic goals for treatment must be agreed	2	5.43 (0.62)	-0.81	0.76	Yes
20	A patient's perceived barriers to work must be assessed	0	5.19 (0.68)	-0.33	-0.48	Yes
23	A patient's expectations about treatment for musculoskeletal pain affect their outcome	1	5.06 (0.73)	-0.82	**1.86**	Yes
41	I consider a patient's social support network in my clinical management	0	4.53 (0.86)	-0.60	1.40	Yes
42	A patient's physical activity level should be considered in the management of their musculoskeletal pain problem	0	5.14 (0.70)	-0.42	-0.14	Yes
59	Reducing a patient's fear is essential to the treatment process	1	5.30 (0.71)	-0.80	0.87	Yes

7.5.6 CFA of the existing biomedical and new biopsychosocial scales

Both the existing biomedical scale and the proposed new biopsychosocial scale have 10-items, and the hypothesised structure for each is a single factor, as illustrated previously in figure 7.1. The items included in each of the analyses are provided in table 7.6 for reference.

7.5.4.1 CFA of the existing biomedical scale

The parameters and fit indices obtained for the initial model are displayed in figure 7.4. These suggested that this initial model was not a good fit. The x^2 statistic was significant, supporting the alternative hypothesis that the covariance matrices of the sample and the estimated population were different. While this might have been expected due to the x^2 statistic's sensitivity to sample size, all the other fit indices, with the exception of the SRMR, also fell outside the thresholds for acceptable fit.

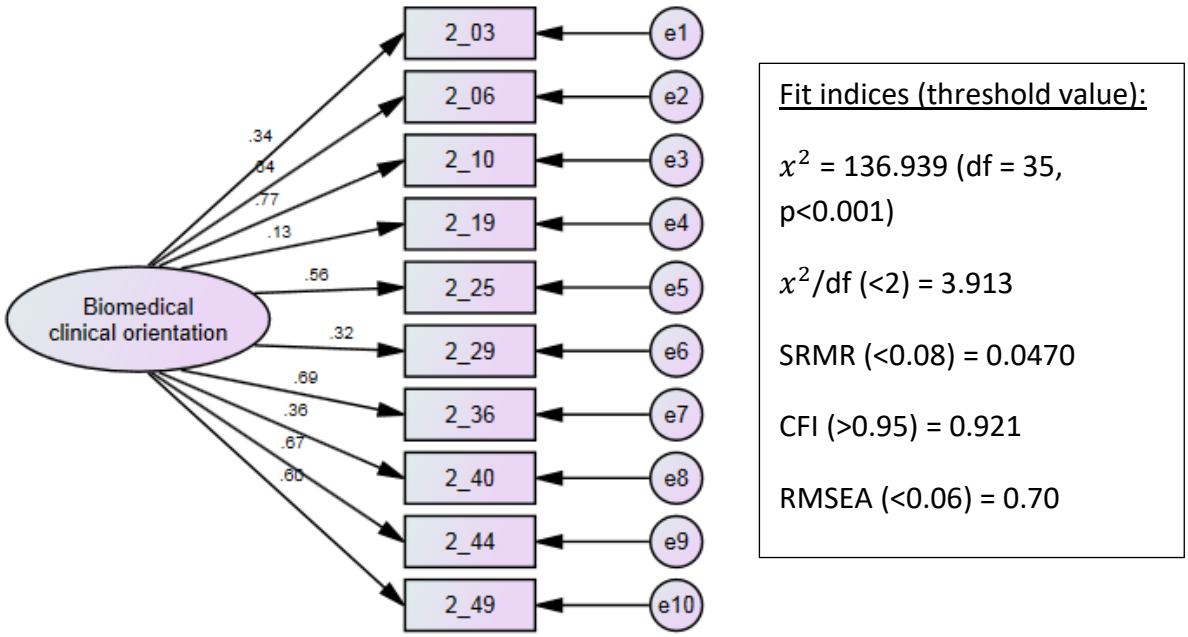


Figure 7.4: Initial CFA model and fit indices for the existing biomedical scale

The modification indices (MIs) produced in this analysis included 16 pairs of error terms that if allowed to co-vary, might result in a better model fit. These are detailed in full in appendix 16a. However, one of the criteria for making a post-hoc modification (detailed in section 7.4.6.3) was that the re-specification must result in a substantial reduction in the x^2 value. When the size of the MI for each of the 16 suggested error pairings were examined, five were substantially larger than the rest. The second criterion was that any

re-specification of the model must be theoretically coherent, therefore each of these five pairs of items was examined to determine if covariance of their error terms was theoretically defensible. The five error pairings, the associated MI (potential reduction in the x^2 value if error terms were allowed to co-vary) and the scale items concerned are detailed in table 7.7.

Table 7.7: Substantial modification indices in the CFA of the existing biomedical scale items

Error pairing	MI	Items
e9 ↔ e10	12.170	44 - The severity of tissue damage determines the level of pain 49 - Musculoskeletal pain indicates the presence of organic injury
e7 ↔ e10	24.864	36 - Pain is a nociceptive stimulus, indicating tissue damage 49 - Musculoskeletal pain indicates the presence of organic injury
e4 ↔ e6	15.270	19 – In the long run, patients with musculoskeletal pain have a higher risk of developing functional impairments 29 - If therapy does not result in a reduction in musculoskeletal pain, there is a high risk of severe restrictions in the long term
e2 ↔ e5	12.249	6 – If patients complain of pain during exercise, I worry that damage is being caused 25 - Patients with musculoskeletal pain should preferably practice only pain free movements
e2 ↔ e3	20.095	6 – If patients complain of pain during exercise, I worry that damage is being caused 10 - Increased pain indicates new tissue damage or the spread of existing damage

While all the items concern aspects of MSK pain, which underpins their shared variance, there is a different emphasis in each of the pairings, which could account for error covariance. Items 44, 49 and 36 concern the specific relationship between tissue damage or injury and pain and items 19 and 29 concern functional impairment or restriction. The error term for item 6 is paired with the error for both items 25 and 10. This item includes two concepts: the relationship between pain and damage and the specific context of exercise. It is therefore conceivable that error associated with item 6 might co-vary with

the error of both item 25, which concerns pain and movement and item 10, which again associates pain with damage.

As the covariance of each of these five pairs of error terms was considered theoretically plausible and associated with a substantial reduction in the x^2 value, they were added to the model. The modified model is displayed in figure 6.6, where the covariance between the error terms is represented by a double-headed arrow.

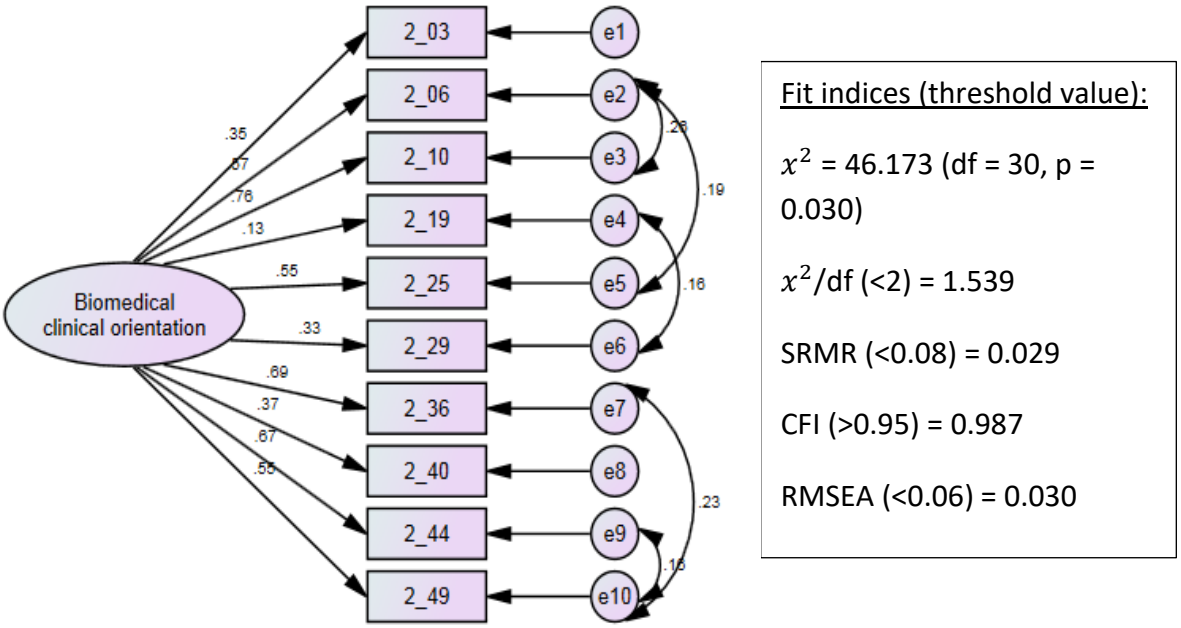


Figure 7.5: Modified CFA model and fit indices for the existing biomedical scale

The fit indices for the modified model (included in figure 6.6) demonstrate the improved fit of the model, with all indices falling below their requisite thresholds thus confirming the fit of the single factor model for the existing biomedical items.

7.5.4.2 CFA of the new biopsychosocial scale

The parameters and fit indices obtained for the initial model are displayed in figure 7.6. Although the value for the SRMR was below the elected threshold and those for all other indices were close to threshold, the model failed to provide an acceptable fit with the data from the sub-sample of 237 respondents.

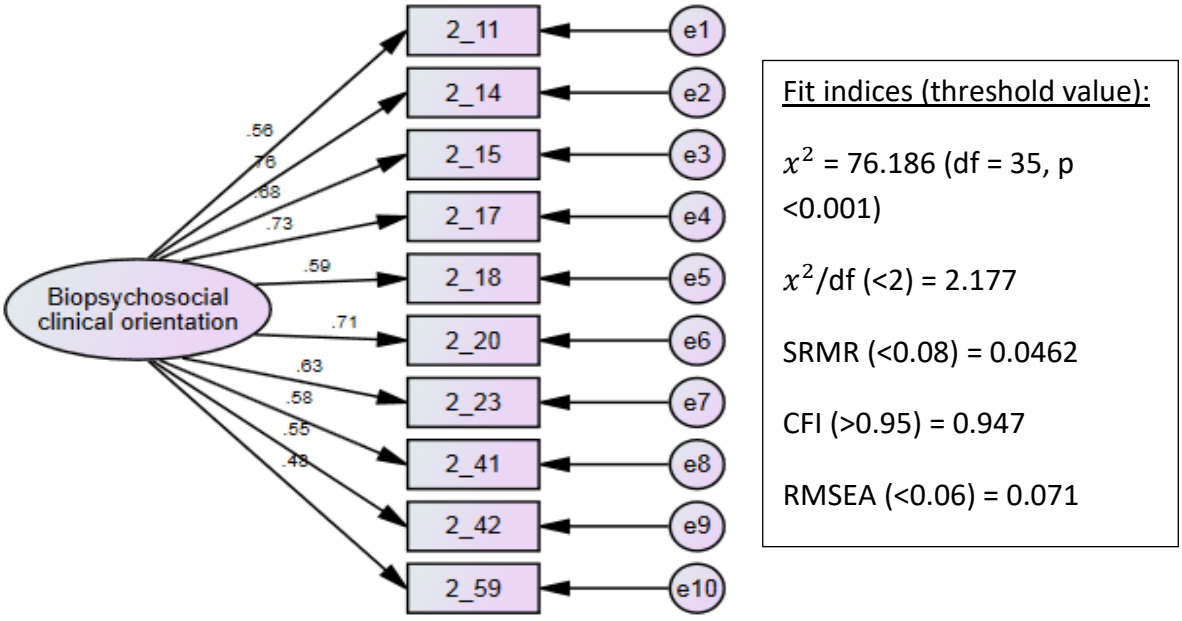


Figure 7.6: Initial CFA model and fit indices for the new biopsychosocial scale

To determine if a better fit could be obtained for the new biopsychosocial model, the MIs were examined. There were eight error covariances suggested (see appendix 16b for detail), but only one had an MI greater than 10. This was between e1 and e4, the error terms associated with items 11 and 17; "Biological, psychological and social factors should be included in the clinical assessment" and "A patient's beliefs about the cause of their musculoskeletal pain must be understood."

It was hypothesised that a patient's beliefs could be considered a sub-set of the psychological factors that should be included in the clinical assessment, and that this could explain the potential for the error associated with these items to co-vary. Therefore, the only modification made to the model for the biopsychosocial items was to specify the covariance between the error terms for items 11 and 17. The modified model and resultant parameters and fit indices depicted in figure 7.7, show that the fit indices fell below the recommended thresholds set, therefore confirming the fit of the single factor solution derived in the EFA.

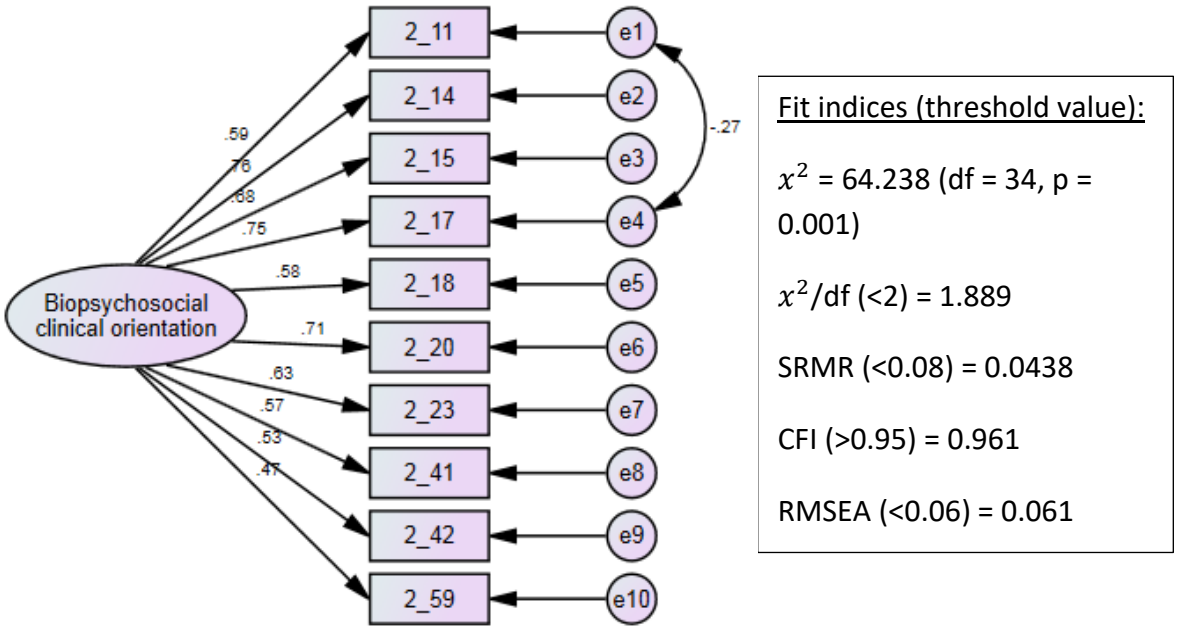


Figure 7.7: Modified CFA model and fit indices for the new biopsychosocial scale

7.6 Discussion

This chapter has described the initial testing of the extended pool of new and existing PABS biopsychosocial items using an iterative EFA. The strongest factor solution obtained was a 10-item single factor solution, which was taken forward for further testing as a new

biopsychosocial orientation scale of the PABS-MSK. Both this new scale and the generic version of the biomedical scale were found to provide an acceptable fit on a subsequent CFA. Both scales were also found to exceed the level of internal consistency, as determined by Cronbach's alpha, considered to be acceptable. In the remaining sections of this chapter the key findings and strengths and limitations of these analyses will be discussed, before concluding with consideration of the implications for this scale development process.

7.6.1 Key findings

7.6.1.1 The performance of the extended pool of biopsychosocial items and structure of the new biopsychosocial scale of the PABS-MSK.

In considering the outcome of the EFA of the biopsychosocial item pool, three key aspects are discussed below, firstly the emerging and resultant factor structure, secondly the fate of the pre-existing PABS items and finally, the key features of item performance.

Factor structure

Following the iterative EFA a 10-item, single factor solution was identified as the strongest representation of the biopsychosocial items. This factor structure was proposed as a new biopsychosocial clinical orientation scale for the PABS-MSK and in the subsequent CFA was also found to provide an acceptable fit for the data in a separate sample.

In the initial stages of the EFA process, whilst the forced two and three factor analyses also delivered interpretable solutions, the three-factor solution became less coherent as poorly performing items were progressively removed. In contrast, a two-factor solution remained theoretically sound through much of the analysis. Given the origin of the new biopsychosocial items in the multi-domained conceptual framework (see chapters 4 and 5), a multi-dimensional structure may well have been anticipated. However, the potential dimensions represented by the extracted factors did not directly reflect the separate

domains in the framework with items originating in the six primary domains distributed across both factors. For example, item 41 - "*I consider* a patient's social support network *in my clinical management*" factored out with other 'clinical behavioural' items, whereas item 15 - "the reaction of a patient's family and friends *will promote recovery*" associated more strongly with the outcome/response factor, although the source statements for both originated from the 'social' domain of the conceptual framework. Rather, the two factors appear to distinguish between items concerning patient outcome or response to treatment and those which are more clinically oriented, or behavioural. It must be stressed however, that it was never the intention to develop a deliberately multidimensional instrument, or to validate the structure of the conceptual framework per se, and therefore item selection and development were not conducted to this end.

In the generation of new items for this scale development process (described in chapter 5), consideration was afforded to the need to develop items that would be compatible with the existing PABS items in terms of both style and response format. To create scale items with which respondents might agree or disagree, many of the uni-conceptual concept mapping statements required the addition of a meaningful context (De Vaus 2002) and two of the most readily adopted frames of reference were hypothetical or anticipated clinical behaviour and beliefs about prognosis. However, although these emphases may have been unintentionally exaggerated during the item writing process, the fact that the distinction was retained with some consistency in the two-factor solution may suggest the potential to distinguish practitioner and patient-related elements within the approach or the differentiation of cognitive and conative (behavioural intention) dimensions of attitude (Ajzen 2005). This factor structure may have prevailed in a larger pool of items, however

in the final stage of the EFA, a forced single factor solution in the 11-item pool proved the most robust (see table 7.3b). Furthermore, throughout the analyses, a substantial degree of correlation was observed between the two factors. This association was greatest (r=0.63) in the final analysis of the 11-item pool; lending support to the representation of the items as a single factor (de Vet et al. 2011).

It is not possible to make any direct comparisons between the findings of this initial analysis of the newly developed biopsychosocial scale and previous studies of the PABS other than in terms of the general performance of the new versus old items. In addition, the approach to conceptualising and testing this new biopsychosocial scale is somewhat different from previous studies of the existing PABS where EFA has been conducted with both the biomedical and biopsychosocial items (Ostelo et al. 2003; Houben et al. 2005; Bishop et al. 2008; Mutsaers et al. 2014; Eland et al. 2016). This approach is consistent with the analysis of a pool of items considered to be indicative of a single construct, but within which a number of latent variables may be identified; which may be an indication that measurement of the target construct should be multidimensional (Simms 2008; de Vet et al. 2011). However, the biomedical and biopsychosocial scales have been operationalised within the PABS as separate scales, in that they are interpreted separately and not summed to provide an overall score for the construct in question. Furthermore, the biomedical and biopsychosocial approaches are arguably, antithetical and therefore their respective scale items cannot be considered to reflect a singular construct. Therefore, future testing of the PABS in a two-variable model CFA would be more appropriate.

Fate of the existing biopsychosocial PABS items

Although the original PABS items exhibited better response distributions, with just one (item 38) being excluded prior to analysis due to excessive kurtosis, they all met the criteria for exclusion and were removed from the EFA before the conclusion of stage 1.

The fact that these items did not perform well alongside the newly developed biopsychosocial items suggests that they do not share as much variance, and therefore conceptual similarity, with the items derived from the new conceptual framework. This may be an indication that the existing PABS biopsychosocial items do not adequately reflect the biopsychosocial approach as conceptualised in this study. This is not surprising given the origin and development of the existing PABS items, which was detailed in chapters 2 and 3. The development of the PABS did not include a comprehensive conceptualisation of either the biomedical or biopsychosocial clinical approach, and drew heavily on measures of patient (fear avoidant) beliefs. The scoping review described in chapter 3 also highlighted that although the PABS contained a wider range of attitudinal constructs than most other existing measures, biopsychosocial constructs were uniformly under-represented. It is feasible that the variable item composition observed for the biopsychosocial scale (or factor) in previous studies of the PABS (Houben et al. 2005; Mutsaers et al. 2014; Eland et al. 2016), is also indicative of this lack of conceptual clarity within the existing items.

Item performance

The imperative to derive items from a clear conceptualisation of the target construct is heavily stressed in the measurement development literature (Clark & Watson 1995; de Vet et al. 2011). However, the scoping review conducted at the beginning of this programme

of research (chapter 3), found this step to be conspicuous by its absence in the majority of measures of HCPs' attitudes and beliefs to date. Given the extent of the subsequent efforts to avoid similar shortcomings in this scale development process, the number of the new biopsychosocial items derived from the earlier conceptualisation study (described in chapter 4) which produced a poor response distribution was disappointing. This outcome will have implications for the interpretation of the findings of this analysis and also potentially for the utility of the resultant scale and its onward development. These will be discussed further in the limitations and implications sections which follow (sections 7.6.2.1 and 7.6.3).

Of the 45 newly developed items, 16 were excluded prior to the analysis as they produced values of skewness and/or kurtosis outwith the a priori thresholds of >1.5 or <-1.5, or failed to elicit any responses in the 'disagreement' half of the scale (see table 7.2). However, there was a general trend toward high levels of agreement with most, if not all the new items including the 10 ultimately included in the new scale (see item descriptives in appendix 14 and table 7.6). Consequently, the resultant scale also produced very low response variance and generally high scores, as illustrated in table 7.5.

Although it is possible that the HCPs who responded to the survey have particularly strong biopsychosocial attitudes and beliefs, it is unlikely that this completely accounts for the findings. When compared to those from previous studies, the participants in this study did not differ greatly either in terms of their general characteristics or scores on the existing PABS scales (see sections 6.5.3 and 6.5.4). This trend in response distributions is also in contrast to those for the generic versions of the existing PABS items (both biomedical and biopsychosocial) which displayed a more even spread of responses, both at item and at

scale level, in keeping with previous results (Ostelo et al. 2003; Bishop et al. 2008; Eland et al. 2016).

In previous studies of the PABS it has been suggested that items which elicit extreme levels of agreement might be particularly close to well established practice guidelines and therefore more prone to social desirability response bias (Ostelo et al. 2003; Houben et al. 2005; Eland et al. 2016). When reflecting on the development and content of the new biopsychosocial items, it is possible to see the way in which the cumulative effect of decisions made at a number of stages in the process, has resulted in a pool of candidate items which are highly concordant with the approach widely advocated in the MSK literature. Participant agreement may therefore be a genuine or aspirational belief, or disagreement not something clinicians would readily admit to even in an anonymous questionnaire. As this issue involves several stages of the scale development process, rather than the EFA per se, it will be discussed further in chapter 9.

It is also worth considering whether the a priori thresholds for skew and kurtosis were too narrow leading to some candidate items with wider ranges of response, and therefore greater discriminative potential, being excluded from the analysis. In determining the thresholds of skew and kurtosis for item exclusion, it was considered beneficial to adopt the criteria utilised in previous studies of the PABS (Houben et al. 2005; Mutsaers et al. 2014). However, it has been suggested that EFA techniques are reasonably robust to violation of the assumption of normality, especially in larger samples (Tabachnick & Fidell 2007) and some argue that such items should be retained in at least the early stages of analysis (Streiner et al. 2015).

Another general feature of the items within this EFA was that by conventional standards, the factor loadings and communalities, and therefore by extension the variance explained by the extracted factor(s), were generally low throughout the item pool. Factor loadings are an expression of the strength of association (or correlation) that an item has with a factor (Tabachnick & Fidell 2007). Loadings of 0.5 or greater are generally considered to indicate a strong association (Nunnally & Bernstein 1994; Osborne & Costello 2009). An item's communality is the proportion of its variance explained by the extracted factors. Higher communalities (closer to one) indicate that a substantial amount of an item's variance is explained by the extracted factor(s) and therefore shared with the other items. Conversely, lower communalities (closer to zero) indicate that a greater proportion of variance is unique to the item and explained by something other than the extracted factors (Tabachnick & Fidell 2007).

The inter-item correlations, which were examined during the pre-analysis checks, were consistently low although for the most part presented the required "calm but insistent sea of small, highly similar correlations" (Green 1978 p665-666, cited in Clark & Watson 1995); and Bartlett's test of sphericity was significant suggesting that the inter-relatedness of items was sufficient to render the data factorable (Field 2009). Furthermore, analyses of item-level data is known to yield lower inter-item correlations, communalities and factor loadings (Gorsuch 1997), as do those of broad, complex constructs typically found in the social sciences (de Vet et al. 2011). However extracted factors may, by convention, be considered of questionable importance if they explain less than 50% of the total and 80% of the common variance in item scores (Floyd & Widaman 1995). The common variance explained by the final single factor solution in this study was 34%, which falls considerably

below this level, although it is comparable to that of the two-factor solution (biomedical plus biopsychosocial factors) reported in studies of the existing PABS, where values range from 25.2% (Eland et al. 2016) to 33.4% (Ostelo et al. 2003; Houben et al. 2005).

However a further issue to consider is that low values of communality and explained variance may also be indicative of a higher-order, or hierarchical factor structure (Gorsuch 1997). Hierarchical structural models are common in the psychological literature (Reise et al. 2000) and it is not at all surprising that these results intimate such a structure for the new biopsychosocial items, given the breadth and complexity of the conceptual framework from which they were derived. As discussion of this issue is pertinent to the whole scale development process, and requires consideration of the bandwidth-fidelity dilemma inherent to measure development (Hogan & Roberts 1996; John & Benet-Martínez 2000; McGrath 2005) it will also be discussed further in chapter 9.

Having identified the most robust and theoretically coherent factor structure for the new biopsychosocial items in the EFA sample, this structure was subsequently tested in a separate CFA sample. In this CFA analysis, the proposed single-factor structure proved to be an acceptable fit with only a single modification (see section 7.5.4.2). The item factor loadings were comparable to those in the previous EFA. These findings provide preliminary evidence for the structural validly of the new biopsychosocial orientation scale.

The internal consistency of the new 10-item scale (Cronbach's alpha=0.828) represents a substantial improvement on that of the existing PABS biopsychosocial scale. Values of Cronbach's alpha for this scale (which were detailed in table 2.2) have consistently fallen below the recommended guideline of 0.7 (de Vet et al. 2011). The poor internal consistency of the existing PABS biopsychosocial scale is one of its most frequently cited

limitations and justifications for redevelopment of the scale (Mutsaers et al. 2012, Eland et al 2016).

7.6.1.3 The structural validity and internal consistency of the existing biomedical scale of the current PABS

This analysis of the generic version of the biomedical items is the first CFA to be conducted on the PABS. Although the model required a small number of theoretically coherent modifications (see section 7.5.4.1), it also attained an acceptable fit thus supporting the structural validity of the generic version of the biomedical scale. The performance of the biomedical items in terms of their factor loadings (range 0.13 to 0.76 in this study) were comparable to those for the corresponding items (range 0.313 to 0.695) reported by Houben et al. (2005). The single lowest factor loading in both studies was for the same item (item 19 *"in the long run, patients with back pain have a higher risk of developing functional impairments"*) although its factor loading was substantially lower in the current study. This indicates that this item may be generally problematic within the scale, however in this study the item demonstrated a different response distribution to both the other items in the scale and to that in the study by Houben et al. (2005). Participants in this study agreed more strongly with this statement (mean=4.85/6) than with any other biomedical statement. This item was also the single item to exceed the threshold for kurtosis discussed in section 7.5.5.1. This may explain this item's extremely low factor loading in this study.

The internal consistency of the generic version of the biomedical scale (Cronbach's alpha=0.782) was comparable to values obtained in all previous studies of the PABS

biomedical scale (range 0.74 to 0.84, see table 2.2). It also remains in excess of the preferred threshold of 0.7, indicating good internal consistency (de Vet et al. 2011).

7.6.2 Strengths and limitations

7.6.2.1. Strengths

A key strength of this stage of the scale development process is that for the first time, items for use in a measure of HCPs' attitudes and beliefs have been derived from a comprehensive framework for the biopsychosocial clinical orientation. As a result, the new scale provides a means of measuring and investigating this clinical orientation to common MSK pain for the future.

This analytical stage was also designed, conducted and reported in accordance with recommended scale development guidelines and recommendations (Mokkink, Terwee, Knol, et al. 2010; de Vet et al. 2011; Streiner et al. 2015). Initially every effort was made in the data collection survey (chapter 6) to obtain data from representative samples of the three participating HCP groups. Additionally, this stage achieved the sample sizes recommended for the planned analyses. Although there are no clear guidelines for the conduct of EFA, it is recommended that the process is iterative and that the methodological choices made at each stage are made transparent (de Vet et al. 2005). This was achieved by developing a clear, step-wise process which included a priori criteria informed by previous studies and methodological literature. In addition, having identified the most theoretically coherent and statistically robust factor structure, this was then tested with CFA in a separate, randomly allocated sample. This is only the second study of HCPs' attitudes and beliefs and the first study of the PABS to undertake both EFA and CFA. As an hypothesised factor structure already exists for the biomedical scale, EFA would have been

inappropriate for these items (de Vet et al. 2011) which were therefore examined directly with CFA.

7.6.2.2 Limitations

The most significant limitation affecting this analytical stage, with the potential to also impact on the performance of the scale, is the non-normal response distributions of many of the new biopsychosocial items. While the significant result of the K-S test for the new biopsychosocial items was understandable given their markedly skewed response distribution, this result was not anticipated for the existing PABS items. Although previous studies do not report the results of a K-S test, their item mean and standard deviation data do not suggest similar systematic distributional problems. It is recognised that the K-S test is sensitive to sample size and usually found to be significant in large samples (Field 2009; Ghasemi & Zahediasl 2012); therefore histograms and Q-Q plots were also examined. Although these confirmed the pronounced distributional issues with new biopsychosocial items, they also confirmed a much better response distribution for the existing PABS items. This was also reflected in their means and standard deviations (detailed in table 7.1 and appendix 14) which were comparable with those obtained in previous PABS studies (Houben et al. 2005; Eland et al. 2016).

Violation of the assumption of normality can affect the reliability of factor analysis (Tabachnick & Fidell 2007) and therefore demands caution in the interpretation of these results. However, multivariate statistical texts suggest that some protection from violations of normality are afforded in larger samples and that the PAF extraction method adopted in the EFA is also fairly robust to such violations; which might provide some confidence in these results (Fabrigar et al. 1999; Tabachnick & Fidell 2007; Field 2009).

However, ML extraction which was used in the CFA is not considered to be so robust (Tabachnick & Fidell 2007). In an attempt to mitigate some of the potential detriment, bootstrapping was employed within these analyses. However, a sensitivity analysis would be recommended using an alternative extraction method, such as asymptotically distribution free (ADF) estimation which does not have any distributional assumptions (Hair et al. 2006). This would be particularly pertinent for the CFA of the biopsychosocial scale where deviation from normality was greater and the analysis was not afforded the potential protection of the large sample size available for CFA of the biomedical scale. ADF is not available in the statistical package (AMOS) which was accessible; however this sensitivity analysis will be conducted prior to wider dissemination of these results.

A further consideration in the interpretation of the results of the EFA of the biopsychosocial items is whether the extracted factors might reflect a shared, skewed, distribution between certain items rather than shared covariance due to an underlying construct (Gorsuch 1997). These distribution factors have also been called 'difficulty factors' (Ten Berge 1972) due to the observation that in analyses of ability scales, the least and most difficult items formed separate factors due to the greater degree of correlation between items which shared either a positively or negatively skewed response distribution (Floyd & Widaman 1995; Gorsuch 1997). However, although a consideration, it seems unlikely that it would be response distribution alone (or even predominantly) which informed the extracted factors in this study for three reasons: 1) The inter-item correlations had been observed to be generally low (see section 7.5.2), 2) items which exceeded the threshold for skew had been excluded and 3) in tandem with the statistical evaluation, each iteration of the analysis was subject to examination of theoretical coherence, which provides confidence in the

conceptual, as well as distributional similarity between the items selected for the final scale.

The high scores and low variance observed for the new biopsychosocial scale (see table 7.5) may also prove problematic for the performance and utility of the scale. Poor response distribution can limit the discriminative ability and responsiveness of the scale and potentially give rise to a ceiling effect (de Vet et al. 2011). The nature and extent of such issues cannot be determined until the new scale is subject to further testing. If they do prove to be an issue, decisions will need to be made as to how to proceed. This may entail a degree of further item development or amendment and should also include more comprehensive pilot testing of the items, the lack of which has been a significant limitation in this process.

Administrative and funding issues within the RI dictated that the data collection survey described in chapter 6 had to be conducted before the end of 2013; thereby foreshortening the time available for item development and testing. More substantial pilot testing may have highlighted the extent of the likely agreement with the new biopsychosocial items and provided the opportunity to address this prior to their inclusion in the survey. However, the aim of this programme of work was the initial testing and development of the PABS-MSK; the results of which will inform the next stage of development, in keeping with the iterative nature of the scale development process (de Vet et al. 2011).

7.6.3 Implications

The generic version of the existing biomedical PABS scale adapted in this study has performed comparably with previous versions of the scale, therefore providing a generic version of the scale. This will have utility for researchers wishing to study HCPs' attitudes

and beliefs across all common MSK pain conditions and allow more consistent comparison between studies which might previously have used a regional specific measure. As the adaptation has been conducted with a range of different HCP groups, it also provides a tool suitable for use across these professional groups.

The results of this study also lend support to an argument that the PABS biomedical scale should now be standardised as 10 items. Studies have understandably continued to test the wider pool of items as the PABS was considered to still be in a development stage. (Mutsaers et al. 2014; Eland et al. 2016). However, although the biopsychosocial scale remains in a development stage, the results of this and previous studies suggest that the biomedical scale performs consistently across different MSK presentations (Ostelo et al. 2003; Mutsaers et al. 2014) and HCP groups (Watson et al. 2008; Bishop et al. 2008); and despite fluctuation in its item composition (sees section 2.8.2).

The problematic response distributions of the new biopsychosocial items, and their potential implications both for these analyses and the future performance of the scale were discussed above. While the extent of these potential problems will need to be determined in future research studies, if proven to be an issue decisions will need to be made as to how to proceed. Although this may involve rewording of items to elicit a greater range of responses, or even re-selection of a number of less 'quintessential' biopsychosocial statements from the conceptual framework; the rigour of the conceptualisation process (described in chapter 4) affords confidence in the content validity of these items. Any amendments should be comprehensively pilot tested to ensure that the same problems of high levels of agreement and poor response distribution are rectified.

In summary, the results of this stage of the scale development process indicate that the PABS-MSK is structurally valid and internally consistent. However, as scale development is an iterative process (de Vet et al. 2011), further investigation of the scale's properties will be required. These will include further construct validity testing to include hypothesis testing and cross-cultural validity. It may also be beneficial to conduct further CFA with both scales included. This would provide further insight into the structural validity of the PABS-MSK. Longitudinal studies will be required to evaluate the scale's responsiveness; the results of which will determine if the biopsychosocial scale will require amendment to address the poor response distribution observed in this preliminary study.

Prior to further validity testing the reliability of the new scale needs to be established. This will be the focus of the next and final stage of this scale development process.

7.7 Conclusions

The structural validity and internal consistency of a 10-item generic-MSK version of the biomedical scale were confirmed, a new 10-item single-factor biopsychosocial scale was developed and its structural validity and internal consistency were also established. The resultant scale, the PABS-MSK, was then subjected to a final stage of scale development; test-retest reliability analysis which is presented in the next chapter (chapter 8).

Chapter 8: Development of a new generic musculoskeletal version of the Pain Attitudes and Beliefs Scale: Test-retest reliability

8.1 Chapter introduction

This chapter describes the sixth and final stage of the scale development process presented in this thesis, examination of the test-retest reliability of the PABS-MSK. Chapter 7 described the development and first phase of psychometric evaluation of the PABS-MSK, a new generic scale for measuring HCPs' attitudes and beliefs about common MSK pain. The structural validity and internal consistency of a 10-item generic-MSK version of the biomedical scale were confirmed, a new 10-item, single-factor biopsychosocial scale was developed and its structural validity and internal consistency were also established. The test-retest reliability testing of the PABS-MSK reported in this chapter was conducted on the baseline and retest data collected during the national survey of HCPs reported in chapter 6. Appendices 11 and 12 contain the supporting materials which are referenced within this chapter.

8.2 Aims and objectives

The aim was to establish the test-retest reliability, measurement error and smallest detectable change (SDC) of the redeveloped, generic PABS-MSK.

To achieve this aim, the following objectives were addressed:

1. To examine the test-retest reliability of both the biomedical and biopsychosocial scales of the PABS-MSK
2. To calculate the measurement error and the SDC for both scales of the PABS-MSK

8.3 Theory overview

Reliability is a key psychometric property of a measurement instrument and concerns its ability to produce similar scores on different occasions when the object of measurement

has not changed (de Vet et al. 2011). If an instrument is reliable, then any change observed can be attributed to change in the object rather than to error in the measurement. Reliability is therefore considered to be "the degree to which the measurement is free from measurement error" (Mokkink et al. 2010 p743). While the fundamental nature of reliability is generally agreed, a variety of different terms have been used to describe it and there are a number of statistical approaches to its assessment (Streiner et al. 2015; de Vet et al. 2011). In this study the terms, definitions and associated measures proposed by the COSMIN initiative (Mokkink, Terwee, Patrick, et al. 2010) are adopted. In this taxonomy, reliability is presented as a multi-dimensional domain which incorporates the related measurement properties of reliability, measurement error and internal consistency. The definition of these properties is provided in box 8.1. While internal consistency is considered a facet of reliability, it was evaluated in Chapter 7 of this thesis, and will therefore not be discussed further here.

Reliability:	The proportion of the total variance in the measurements which is because of "true"* differences among patients
Measurement error:	The systematic and random error of a patient's score that is not attributed to true changes in the construct to be measured
Internal consistency:	The degree of interrelatedness among the items

*"True" is used in the context of classical test theory, where the relationship between the true and observed scores are represented as:

$Y = \eta + \varepsilon$

where Y = the observed score, η = the 'true' score and ε = error term of measurement. The "true" score is the average score that would be obtained if the measurement were taken an infinite number of times.

Box 8.1 COSMIN definitions of the measurement properties included in the reliability domain (Mokkink et al. 2010, de Vet et al. 2011, Streiner et al. 2015)

8.3.1 Test-retest reliability

Test-retest reliability concerns the degree to which repeated uses of a measure produces similar results in a stable population (Terwee et al. 2007). The reliability of an instrument is the proportion of the total measurement variance which is due to 'true' differences between subjects, rather than other systematic or random sources of variation in the data. Reliability can be represented by the following equation, which is also the calculation performed to determine the intraclass correlation coefficient (ICC), the reliability statistic appropriate for use with continuous data (Streiner et al. 2015).

Reliability $= \frac{\sigma_p^2}{\sigma_p^2 + \sigma_{error}^2}$ $\quad \sigma_{error}^2 = \sigma_o^2 + \sigma_{residual}^2$

σ_p^2 = variance due to systematic differences in 'true' scores of subjects

σ_o^2 = variance due to systematic differences over time

$\sigma_{residual}^2$ = variance due to random error (interaction between subjects and over time)

This form of the equation is the version known as ICC (2,1) in the classification system proposed by Shrout and Fleiss (1979). This system includes different forms of ICC depending on the way in which subjects are chosen and raters (or time points) assigned, and the number of measurements taken from each subject at each time point. ICC (2,1) is the most appropriate for studies of test-retest reliability as the selection of time points is considered random, all subjects participate at each time point (model 2) and a single measurement is taken at each time point (Weir 2005).

This equation for the ICC includes the variance due to systematic differences over time (σ_o^2) in the denominator and therefore represents absolute agreement. When this term is

omitted, the result is an ICC which represents the relative consistency of scores, a less stringent criterion for reliability (de Vet et al. 2011).

Reliability is dependent on the variability of the construct of interest within the sample and is therefore relative to the population under investigation, rather than an absolute quality of the instrument (Streiner et al. 2015). Consequently, reliability parameters should be determined for the population in which a measure is intended to be used (Streiner et al. 2015).

8.3.2 Measurement error and smallest detectable change

It has been argued that a separate measure of measurement error is both unnecessary (as this information can be derived from the ICC formula) and potentially misleading if interpreted in isolation from the variability of the measurement scores (Streiner et al. 2015). However, de Vet et al (2006) emphasise the differential value of measures of measurement error and reliability in evaluating the performance of a measurement instrument, highlighting that the two properties address two different issues. Reliability concerns the instrument's ability to discriminate between subjects despite error in the measurement; while measurement error establishes the degree of agreement between repeated measures, expressed in the units of the measurement instrument (de Vet et al. 2011). The measurement error is required to calculate the smallest detectable change (SDC), which is the smallest change in a score that can be interpreted as a 'real' change above measurement error (de Vet et al. 2011).

As the PABS has been used in a range of studies to both discriminate between groups of HCPs and to evaluate potential attitudinal change following HCP training programmes

(Overmeer et al. 2009; Demmelmaier et al. 2012; Beneciuk & George 2015), information about both the reliability and measurement error of the redeveloped PABS is required. These properties were therefore evaluated in the final stage of this scale development process and the methods used in each case are detailed further below.

8.4 Methods

8.4.1 Summary of study design

This initial stage of psychometric analyses was conducted on data collected in the nationwide survey of HCPs reported in chapter 6, to develop a new biopsychosocial scale and confirm the existing biomedical scale of the PABS for the new generic PABS-MSK. Relevant data were extracted for 116 HCPs who completed both baseline and follow-up questionnaires of the national survey (chapter 6). The detailed method for the national survey was reported in chapter 6, however a summary is provided here.

8.4.2 Samples and sample size

The sampling frame for the retest survey was the HCPs who had responded to the main baseline questionnaire and consented to further contact following phase one of the survey (see chapter 6, section 6.4.4 for further detail). A convenience sample of the first 50 responders from each professional group who consented to further contact was sent the retest questionnaire six weeks after the return of their first questionnaire. If needed, reminders were mailed after two and four weeks. A minimum of 50 responses has been recommended for estimating test-retest reliability (Terwee et al. 2007).

8.4.3 Data analysis

The data for this study were collected using the baseline and retest questionnaires described in section 6.4.6. Copies of these questionnaires are included in appendix 11.

The data acquired at baseline had previously been checked for errors and missing data (see sections 6.4.8.2 and 7.4.3.2). The follow-up data were also entered into a secure database, checked for errors and missing data. If only a single response on a scale was missing, it was substituted with the mean of the remaining values. If more than one response was missing, the case was removed from the analysis.

8.4.3.1 Test-retest reliability analysis

For each of the scales, test–retest reliability was analysed using ICC (2,1). Values for ICCs range from zero to one, with an ICC of one occurring when error variance (systematic and random) is negligible in comparison to subject variability and the measurement instrument is able to clearly differentiate subjects (Sim & Wright 2000). Conventions for ICC values are frequently classified as poor (ICC < 0.40), fair (0.40 ≥ ICC ≤ 0.59), good (0.60 ≥ ICC ≤ 0.74) and excellent (0.75 ≥ ICC ≤ 1.0) (Cicchetti 1994). Typically, 0.7 is the minimum acceptable ICC value for research purposes (Nunnally & Bernstein 1994; Terwee et al. 2007). In this study, an ICC of at least 0.7 was required to establish adequate reliability of the PABS-MSK scales.

8.4.3.2 Measurement error and smallest detectable change

The measures of measurement error for continuous variables used in this study were the standard error of measurement (SEM) and limits of agreement (LoA). Bland and Altman (1986) plots were produced for both the biomedical and biopsychosocial scale data by plotting the mean of the scores obtained at the two time points against the difference between the two. Reference lines were added for the mean difference between the two scores and the upper and lower 95% LoA (the values 1.96 standard deviations above and below the mean difference). The Bland and Altman plots provide an easily interpreted,

visual representation of the systematic and random differences in paired measurements (Sim & Wright 2000). It has also been suggested that the use of the units of the measurement is more clinically meaningful than the "dimensionless ratio of variances" that is the ICC (Streiner et al. 2015 p.190). Several features of the plots were examined to determine the form and magnitude of any measurement error. Systematic error, or bias is represented by the mean difference between the two measurements. The closer this reference line is to zero, the smaller the systematic error in the data (de Vet et al. 2011). The range and pattern of the values on the plot were also examined to identify any outliers and if the size of differences varied in a systematic way with the size of the mean. This would be evidenced by a 'funnel' pattern produced as the difference between time-points increases (or decreases) across the range of the measurement (Rankin & Stokes 1998).

The standard error of measurement (SEM) estimates how repeated measures of a person on the same instrument tend to be distributed around his or her "true" score. The true score is always an unknown because no measure can be constructed that provides a perfect reflection of the true score. SEM is directly related to the reliability of a test; that is, the larger the SEM, the lower the reliability of the test and the less precision there is in the measures taken and scores obtained. The SEM is an estimation of the standard deviation of repeated measures from an individual subject and represents the spread of measurements obtained from an instrument (de Vet et al. 2011). Once established, any change observed on repeated measures must exceed the SEM to be confident that a real change, above measurement error, has occurred (Terwee et al. 2007). Therefore, the smaller the SEM the lower the measurement error of the instrument. The SEM was calculated as follows:

$$SEM_{agreement} = \sqrt{(\sigma_0^2 + \sigma_{residual}^2)}$$

As for the ICC, the more stringent agreement version was calculated rather than the $SEM_{consistency}$ which excludes the variance due to systematic differences over time. This allows 'real' changes to be distinguished from any systematic effect of the repeated measurement as well random error (Terwee et al. 2007). The variance components for the calculation of the SEM were obtained from a two-way ANOVA with repeated measures on both subjects and time points (Rankin & Stokes 1998; de Vet et al. 2006). The SEM was then used to calculate the SDC for the new PABS scales when applied to both an individual and a group. The equations for SDC_{ind} and SDC_{group} are:

$$SDC_{ind} = 1.96 \times \sqrt{(2 \times SEM_{agreement})} \qquad SDC_{group} = \frac{SDC_{ind}}{\sqrt{n}}$$

8.5 Results

In total, 150 HCPs were invited to complete the re-test questionnaire and 116 of these responded. This represents a follow-up response rate of 77.3%. Of these 116 HCPs, 32/50 were GPs, 42/50 were chiropractors and 42/50 were physiotherapists (response rates of 64%, 84% and 84% respectively).

8.5.1 Baseline and follow-up data

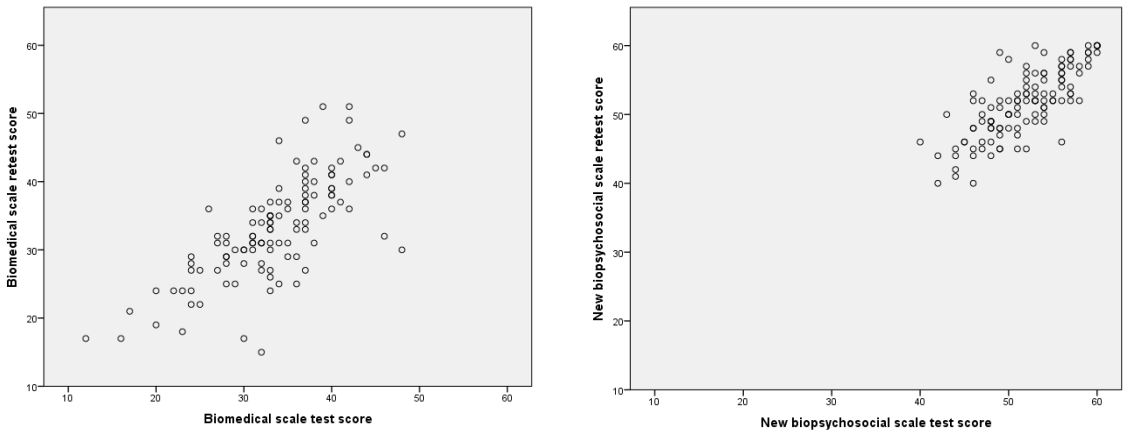
In the baseline test data, there were missing responses for five respondents (six items) in the biomedical scale data and for three separate cases (three items) in the biopsychosocial scale data. A single case with two missing item responses on the biomedical scale was removed from calculation of test scores for this scale. All other missing responses were

substituted with the mean of the remaining values (see section 8.4.3). There were no missing responses in the retest data. Table 8.1 shows the mean biomedical and biopsychosocial scale scores at baseline and follow-up and the mean difference in scale scores between the two time points. There is minimal difference in mean change scores for both scales.

Table 8.1: Mean, standard deviation and differences for the test and retest scores for PABS-MSK scales

	Baseline (n=150)	Follow-up (n=116)	Mean difference in scale score
Biomedical scale score (scale 10-60)	33.51 (6.77)	33.17 (7.54)	0.34 (5.139)
Biopsychosocial scale score (scale 10-60)	51.84 (4.70)	51.75 (4.96)	0.09 (3.27)

The relationships between the test and retest scores for both scales are shown in figure 8.1. The scatter plots in figure 8.1a show that scores of the biomedical scale are spread across much of the scale, although there is a clustering of scores in the middle part of the scale. The plot also suggests that the test and retest scores are correlated. Although the scatter plot for the biopsychosocial scale in figure 8.1b suggests that the test and retest scores for this scale are strongly correlated, it also shows that the scores are highly clustered towards the top end of the scale, potentially indicating a ceiling effect and lack of discrimination.



a. **b.**

Figure 8.1: Scatterplot of test vs. retest scores for a. the existing biomedical scale and b. the biopsychosocial scale

8.5.2 Reliability, measurement error and SDC of the existing biomedical scale

8.5.2.1 Reliability

The ICC (2,1) for the existing biomedical scale was 0.74 which exceeds the minimum standard of 0.7 described in section 8.4.3.1 (Nunnally & Bernstein 1994; Terwee et al. 2007). However the 95% CI for the ICC was 0.649 to 0.815 therefore, while the sample statistic suggests that the generic version of the scale demonstrates an acceptable level of test-retest reliability, the possibility that the population parameter might lie slightly below (or indeed further above) the 0.7 threshold can not be excluded.

8.5.2.2 Measurement error and SDC

The paired test and retest scores are also represented in the Bland and Altman plot in figure 8.2. The solid reference line depicts the mean difference between the two scores of -0.35,

which is indicative of very little systematic difference between the test and retest scores.

The upper and lower LoA for the existing biomedical scale are -10.42 and 9.72 respectively.

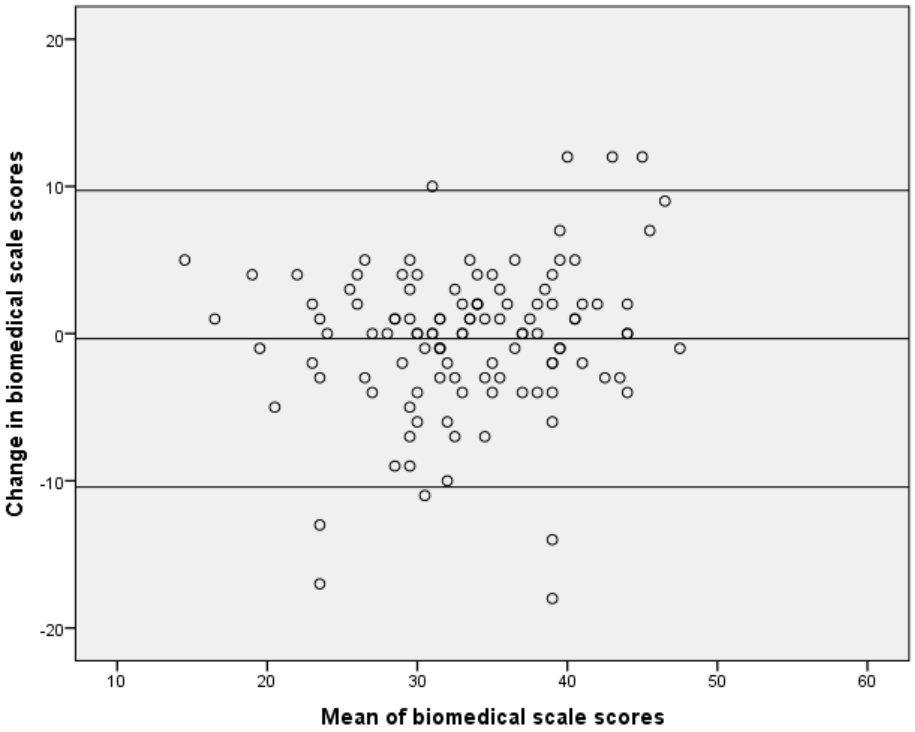


Figure 8.2: Bland Altman plot for the existing biomedical scale

The error components generated from the 2-way ANOVA of the biomedical scale data are shown in table 8.2 and calculation of the SEM and SDC are detailed in box 8.2.

Table 8.2: The variance components of the biomedical scale scores

Variance (person) (σ_p^2)	38.143
Variance (time) (σ_o^2)	Estimate set to zero because is redundant
Variance (error) ($\sigma_{residual}^2$)	13.148

$$\boldsymbol{SEM_{agreement}} = \sqrt{(\sigma_0^2 + \sigma_{residual}^2)}$$

$$= \sqrt{0 + 13.148}$$

$$= \mathbf{3.63}$$

$$\boldsymbol{SDC_{ind}} = 1.96 \times \sqrt{(2 \times SEM_{agreement})}$$

$$= 1.96 \times \sqrt{7.25}$$

$$= \mathbf{5.28}$$

$$\boldsymbol{SDC_{group}} = \frac{SDC_{ind}}{\sqrt{n}}$$

$$= \frac{5.28}{\sqrt{115}}$$

$$= \mathbf{0.49}$$

Box 8.2: Calculation of the SEM and SDC for the existing biomedical scale

These calculations suggest that when used to evaluate change in the score of an individual HCP on the biomedical scale, a change of greater than 6 points will be required to be certain of a real change above measurement error. This figure is rounded up from 5.28 as individual scores will be in whole figures. When evaluating group scores on the scale, a change of greater than 0.49 could be interpreted as 'real change'.

8.5.3 Reliability and measurement error of the new biopsychosocial scale

8.5.3.1 Reliability

The ICC (2,1) for the new biopsychosocial scale in this sample was 0.77, which would be considered indicative of excellent test-retest reliability (Cicchetti 1994). Although again, with a 95% CI of 0.69 to 0.84, the possibility that the population value might lie just below - or substantially above - the minimum standard of 0.7 described in section 8.4.3.1 (Nunnally & Bernstein 1994; Terwee et al. 2007) can not be excluded.

8.5.3.2 Measurement error and SDC

The paired test and retest scores for the new biopsychosocial scale are represented in the Bland and Altman plot in figure 8.3. The mean difference between the two scores is -0.95 which would again suggest very little systematic difference, or bias between the test and retest scores. The LoA for the new biopsychosocial scale are -7.36 and 5.46.

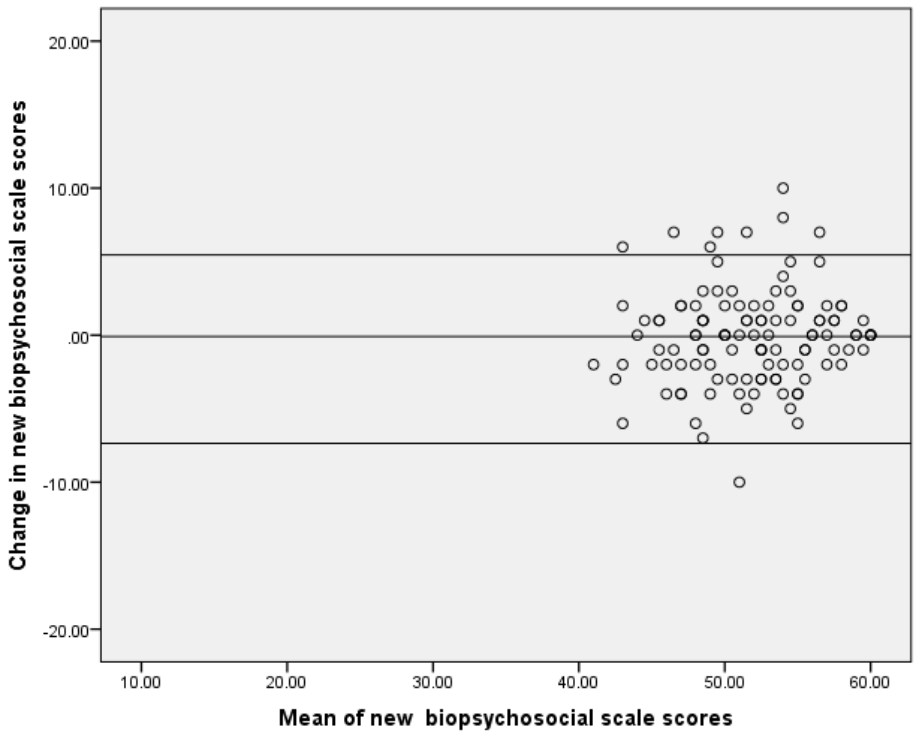


Figure 8.3: Bland Altman plot for the new biopsychosocial scale

The error components generated from the 2-way ANOVA of the biopsychosocial scale data are shown in table 8.3 and calculation of the SEM and SDC are detailed in box 8.3.

Table 8.3: The variance components of the biopsychosocial scale scores	
Variance (person) (σ_p^2)	*18.016*
Variance (time) (σ_o^2)	*Estimate set to zero because is redundant*
Variance (error) ($\sigma_{residual}^2$)	*5.306*

$$\boldsymbol{SEM_{agreement}} = \sqrt{(\sigma_0^2 + \sigma_{residual}^2)}$$

$$= \sqrt{0 + 5.306}$$

$$= \mathbf{2.30}$$

$$\boldsymbol{SDC_{ind}} = 1.96 \times \sqrt{(2 \times SEM_{agreement})}$$

$$= 1.96 \times \sqrt{4.60}$$

$$= \mathbf{4.20}$$

$$\boldsymbol{SDC_{group}} = \frac{SDC_{ind}}{\sqrt{n}}$$

$$= \frac{4.20}{\sqrt{116}}$$

$$= \mathbf{0.39}$$

Box 8.3: Calculation of the SEM and SDC for the new biopsychosocial scale

These calculations suggest that when used to evaluate individual changes in scores on the new biopsychosocial scale, values greater than 5 points will be required to be certain of a

real change. For group scores, the change will need to be greater than 0.39 to be interpreted as 'real change' above measurement error.

8.5.4 Comparison of participants in retest study versus initial survey sample

The figures shown in table 8.4 indicate that there were some differences between participants in the retest study and the remainder of the initial survey sample.

Table 8.4: Mean biomedical scale and biopsychosocial scale scores and characteristics for retest study sample v the remainder of the initial survey sample

	Retest sample (n=116)	Rest of initial sample (n=471)
New generic biomedical scale	33.5 (6.8)	35.0 (6.5)
Old biopsychosocial scale	36.0 (4.6)	34.8 (4.7)
New generic biopsychosocial scale score	51.8 (4.7)	51.7 (4.6)
Gender: % female	45.6%	57.9%
Years since qualification	19.9 (11.2)	18.2 (10.6)
Proportion of role which is clinical		
76-100%	90.4%	82.2%
50-75%	5.2%	14.5%
<50%	4.3%	3.2%
Work setting: %		
NHS only	42.6%	40.0%
Non-NHS only	40.9%	48.7%
Mixed settings	16.5%	11.3%
Received MSK training: %	80%	65.4%

Compared with the rest of the survey sample, the participants in the retest study scored slightly lower on the biomedical scale, higher on the old biopsychosocial scale, were less likely to be female, were qualified for a longer period of time, were more likely to work for a greater proportion of time in a clinical role and were more likely to have received some form of MSK training.

These data also show some differences between the two samples in terms of their scores on the old biopsychosocial scale compared with the new generic biopsychosocial scale. There was a difference in old biopsychosocial scores between the two groups, whereas

there is no difference in scores obtained with the new generic biopsychosocial scale. This indicates that there may be a potential problem with the discriminative ability of the new scale.

8.6 Discussion

This chapter summarises the findings of a reliability study of the newly developed generic PABS-MSK. The biomedical scale (scale range of 10 to 60) was found to be reliable (ICC=0.74), with a measurement error of plus or minus 10 points. The SDC for an individual HPC was 6 points, whilst for group analysis it was 0.49 points. The biopsychosocial scale (scale range of 10 to 60) also demonstrated good reliability (ICC=0.77), with a measurement error of approximately plus or minus 7 points. The SDC for an individual HCP was 5 points, whilst for group analysis it was 0.39 points. The remainder of this discussion section concerns implications of the reliability testing process. Reflections on the scale development process as a whole and more detailed discussion of the nature of the items and their development is presented in chapter 9.

8.6.1 Key findings

8.6.1.1 Reliability of the new generic MSK Pain Attitudes and Beliefs Scale (PABS-MSK)

Test-retest reliability of the new PABS-MSK

Both biomedical and biopsychosocial scale in the current study meets the criterion for reliability set out in section 8.4.3.1 (ICC greater than 0.7) and therefore both scales can be considered to have acceptable reliability (Nunnally & Bernstein 1994; Terwee et al. 2007). The findings of this current investigation are also broadly in line with those of previous studies. Three previous studies have investigated the reliability of various versions of the PABS (Laekeman et al. 2008; Bishop et al. 2008; Bowey-Morris et al. 2010). The biomedical

scale used in two of the studies including this current investigation was the 10-item scale and are directly comparable to the PABS-MSK (Laekeman et al. 2008; Bishop et al. 2008). Bowey-Morris et al. (2010) used a 12-item biomedical scale which is not directly comparable. All the studies, including this current version used biopsychosocial scales of varying length and so direct comparisons across all the studies is not possible. The reliability coefficients for these studies are summarised in table 8.5.

Table 8.5: Reliability correlation coefficients for biomedical and biopsychosocial scales of the PABS

	Biomedical scale	Biopsychosocial scale
Laekeman et al. 2008	Pearson's r=0.83	Pearson's r=0.70 (4 item)
Bishop 2008	GPs: ICC=0.78 (95%CI=0.69-0.86) PTs: ICC=0.82 (95%CI=0.76-0.87)	GPs: ICC=0.73 (95%CI=0.61-0.82) PTs: ICC=0.76 (95%CI=0.68-0.82) (9-item)
Bowey-Morris et al. 2010	ICC=0.81(95%CI= (12 item version)	ICC=0.65 (5-item)

Note: GP=General Practitioner, PABS = Pain Attitude and Beliefs Scale, PT= Physiotherapist, ICC = Intraclass correlation coefficient

Bowey-Morris et al. (2010) examined the test-retest reliability of the PABS in a convenience sample of GPs (n=83). A 12-item biomedical scale and 5-item biopsychosocial scale was adapted for use in a GP population. They found the ICC on the biomedical scale was 0.81 and on the biopsychosocial scale 0.65. Investigators used a Pearson correlation to investigate the test-retest reliability of a German translation of the PABS (Laekeman et al. 2008) which is regarded as an inappropriate measure of reliability and will frequently produce coefficients which are greater than true reliability (Streiner et al. 2015). Bishop

(2008) used the 10-item biomedical scale and 9-item biopsychosocial scale to evaluate reliability in random samples of GPs (n=73) and physiotherapists (n=153). ICCs on the biomedical scale were 0.78 for GPs and 0.82 for physiotherapists and on the biopsychosocial scale was 0.73 for GPs and 0.76 for physiotherapists. No study has previously evaluated the reliability of the PABS in a chiropractic population.

8.6.2 Strengths and limitations

8.6.2.1 Strengths

This study was designed, conducted, analysed and reported in accordance with COSMIN recommendations and the theoretical considerations outlined previously in chapter 8, section 8.2 (Mokkink, Terwee, Patrick, et al. 2010). This study recruited 116 participants, which substantially exceeded its recruitment target of 50 thereby ensuring sufficient participants for the reliability analyses. The recruitment of HCPs was broadly equal across GPs, physiotherapists and chiropractors, thus allowing any inference drawn about the reliability of the new PABS-MSK to be extended to all three of these HCP populations. Table 8.4 indicates that the sample in this study was similar to the wider survey sample, indicating that this was a broadly representative sample for the purposes of transferability. In addition, the 6 week time period between test and retest exceeds the 2 week recommendations, and therefore mitigates against the likelihood of recall bias (de Vet et al. 2011). Since attitudes and beliefs are unlikely to have changed during this time period this 6 week time frame between tests is acceptable (de Vet et al. 2011).

8.6.2.2 Limitations

A clear limitation of the newly developed biopsychosocial scale is the clustering of responses at the upper end of the scale, shown in figure 8.1b. This clustering has occurred

because of skewed response distributions in the biopsychosocial items which can be seen in section 8.5.1 and leads to two potential concerns; suppressed reliability estimates and ceiling effects.

First, the extremely small variability in scores on the new biopsychosocial scale observed in this study may have resulted in a low estimate of reliability, due to the associated difficulty in differentiating between scores, even if the measurement error is small (de Vet et al 2005). It is therefore reassuring that even with the clustered response distribution, the ICC (2,1) for the new scale was 0.77. Two possible factors may have exacerbated the issue of poor response distribution: social desirability bias and convenience sampling (James et al. 1984). Firstly, social desirability, the tendency of survey respondents to answer questions in a manner that will be viewed favourably by others, may explain the clustering of responses at the upper (or perceived as desirable) end of the scale (James et al. 1984). Secondly, in order to ensure a broadly equal distribution of HCPs, the sample recruited in this study was a convenience sample of the first 50 respondents from each professional group. Whilst convenience sampling per se is not generally considered to be problematic for reliability testing this method of sampling may have introduced systematic biases which may have led to a greater clustering effect than may otherwise have been the case. There is evidence of differences in attitude and other characteristics between early and late survey respondents in both general and patient populations (Helasoja et al. 2002; Vink & Boomsma 2008) which is also likely to extend to HCPs. In the survey described in chapter 6 the information sheets (Appendix 12) made it clear to participants that the purpose of research was to develop an attitudes and beliefs scale, which may have encouraged more biopsychosocially orientated HCPs to respond. Table 8.4 and figure 8.1 provides conflicting

evidence of this potentially important attitudinal difference which can be seen on examination of the old and new biopsychosocial scales. The new generic biopsychosocial scale suggests that there is no difference between the retest study sample and the remainder of the survey population but examination of the mean scores and standard deviations of 51.8 (4.6) on a scale of 10 to 60 and the scatterplot in figure 8.1b reveal the extent of clustering of scores at the upper end of the scale. Further examination of the old biopsychosocial scale, with a mean score of 36.0 (4.6) on a scale of 9 to 54, does not show clustering to the same extent but does reveal that the retest sample scores higher than the remainder of the survey sample. It seems probable, and in line with previous evidence (Helasoja et al. 2002; Vink & Boomsma 2008), that those HCPs with the greatest interest, knowledge and awareness of biopsychosocial practice may have responded earliest to the initial survey and were therefore more likely to be recruited to this test-retest reliability study. This may explain the clustering of scores in this study, but may also contribute to an elevated ICC.

Second, this response distribution of the generic biopsychosocial scale with the scoring in the upper end of the scale raises a broader concern of a ceiling effect (de Vet et al. 2011). This may be particularly problematic in longitudinal studies which seek to examine changes in HCPs' pain attitudes and beliefs over time where a lack of responsiveness of the scale may mean that any change in attitudes or beliefs may not be detected (de Vet et al. 2011). This may also be a problem for studies which seek to discriminate between known groups or even extreme groups (Streiner et al. 2015). The comparison of generic biopsychosocial scale scores for the two samples in Table 8.4 provide an early warning that lack of discriminatory ability may be a problem for this new scale. It is acknowledged that more

robust pilot testing of items following the item writing stage may have resulted in earlier identification of skewed response distributions (Hessling et al. in Lewis-Beck et al. 2004).

8.6.3 Implications

Given these findings, the priority for further research is to investigate whether it is possible to improve the response distribution of the biopsychosocial scale and then retest its reliability properties. Having established the reliability, measurement error and the smallest detectable change of the PABS-MSK, an important area for further research would be to establish the responsiveness of the PABS-MSK to changes in the attitudes and beliefs of HCPs towards patients with MSK conditions. In addition, further work is required to establish the reliability of the PABS-MSK in different populations of HCPs nationally and internationally.

8.7 Conclusions

This study has demonstrated the test-retest reliability of the biomedical and biopsychosocial scales (ICCs are 0.74 and 0.77 respectively). Measurement errors (±10 and ± 7 points respectively) and SDCs (SDC_{group} are 0.49 and 0.39 points respectively) have also been calculated. These findings suggest that the PABS-MSK has good utility as a measure of pain attitudes and beliefs about MSK pain. However, one important limitation of the biopsychosocial scale is the clustering of scores in the upper half of the scale and low variance, which indicates a response skew and raises the possibility of a ceiling effect which may reduce the usefulness of this scale in measuring change. Further research, beyond this programme of research, is required to improve the response distribution of the biopsychosocial scale.

The next chapter will summarise this thesis, discuss the main findings and draw overall conclusions and implications regarding those findings.

Chapter 9: Thesis discussion and conclusion

9.1 Introduction

The aims of this thesis were to develop and test a new generic version of the PABS and to develop a new biopsychosocial scale for this version of the measure, namely; the PABS-MSK. The rationale for this research programme was described in chapter 2, where the associations between HCPs' attitudes and beliefs, their clinical behaviour and, as yet, incomplete implementation of the biopsychosocial approach (Pincus et al. 2013) were explored. A key limitation in this field was the lack of a robust tool with which to measure HCPs' attitudes and beliefs about MSK pain. The PABS (Ostelo et al. 2003; Houben et al. 2005) was identified as one of the most promising of the existing measurement tools, but had several key weaknesses which this programme of research sought to address.

The scoping review (chapter 3) conducted as a precursor to the scale development process identified that the PABS was the most conceptually comprehensive of the available tools, therefore providing additional support for the rationale to pursue further development of the PABS. This review also highlighted the weakness in the conceptual underpinning in the process of development of existing measures, which coupled with the absence of a comprehensive conceptual framework from which to develop a new biopsychosocial measurement scale, necessitated the development of a new conceptual framework for the biopsychosocial clinical approach to common MSK pain. This was presented in chapter 4 and formed the foundation for a rigorous scale development process and initial psychometric testing of the PABS-MSK (chapters 5 to 8). This final chapter presents an overall summary of the key findings of this programme of research, the key strengths and limitations of the research and the implications for clinical practice, HCP education and future research. The chapter concludes with a synopsis of the contribution that this thesis

has made to the body of knowledge concerning the biopsychosocial approach to MSK pain and the measurement of HCPs' attitudes and beliefs.

9.2 Summary of key findings

9.2.1 Conceptual breadth of existing measures of HCPs' attitudes and beliefs

The narrow conceptual range of existing measures was demonstrated in the scoping review reported in chapter 3. Although the review identified 15 second-order constructs which had been used in the quantitative investigation of HCP's attitudes and beliefs to date, the existing measures each comprised only a limited number of these. The 19-item PABS demonstrated the broadest conceptual range, although this too only included seven of the 15 constructs identified. The constructs found to be most under-represented in existing measures were affective elements such as clinician confidence in their ability to treat, and regard for, patients with common MSK conditions. This is in marked contrast to much of the qualitative research in this area, which has consistently highlighted the difficulties, perceived lack of skills and tensions which HCPs can experience when working with patients with common MSK pain conditions (Corbett et al. 2009; Synnott et al. 2015; Jeffrey & Foster 2012; Barlow & Stevens 2014). Secondly, very few psychosocial constructs featured in either the formal measures identified or individual items used to quantify HCPs' attitudes and beliefs. Consequently, there were no existing tools or items with the potential to contribute to strengthening the existing PABS biopsychosocial scale.

The scoping review also exposed the unintended consequence of a small number of conceptually narrow formal measures dominating this area of study. The utilisation of the same measures across studies confers a number of advantages; including the comparability and generalisability of findings (de Vet et al. 2011; Terwee et al. 2007). However, this trend

has also served to compound the under-representation of potentially relevant attitudinal constructs. This highlights the importance of continued scrutiny of established measures to ensure that they continue to adequately reflect the scope of the target construct as understanding of it evolves. These findings highlighted the need to develop a comprehensive conceptual framework for the biopsychosocial approach to MSK pain, which had not previously been undertaken.

9.2.2 Conceptualisation of the biopsychosocial clinical approach

Concept mapping was used in this thesis to conduct the first comprehensive, grounded conceptualisation of the biopsychosocial clinical approach to common MSK pain (chapter 4). The concept mapping method is a novel and rigorous approach which enables a group of individuals to develop a coherent conceptual framework of a complex idea or construct (Trochim & McLinden 2016). The novel contribution of the resulting conceptual framework was the much broader range of components included within the framework. The framework comprised six primary and 24 secondary domains (see figure 4.6). Two of the primary domains to emerge are particularly concordant with more recent attention MSK pain research: macro-level social factors and therapeutic relationship.

Social factors beyond an individual's immediate domestic or work situation which were included in the framework were: physical environment, resources (such as the availability of health services or access to community facilities) and socio-economic context. The impact of wider social factors on the individual with MSK pain is now more widely recognised than previously; for example recent findings have confirmed the association between socioeconomic status and pain (Macfarlane et al. 2009; Wakefield et al. 2015), disability (Dorner et al. 2011) and treatment outcome (Lowe et al. 2014). Furthermore,

healthcare policies or organisational changes leading to cuts to HCP training funds and restrictions on the number and length of treatment sessions that can be offered to patients with MSK pain, can also limit the ability of HCPs to deliver biopsychosocial care (Duncan & Stephenson 2011; Sanders 2013; Greatbatch 2016).

The volume and importance of concept mapping statements representing the therapeutic relationship domain also correspond with wider interest in non-specific treatment effects in MSK conditions (Miciak et al. 2012; Testa & Rossettini 2016; Zou et al. 2016). While recognition of the significance of therapeutic relationship (or alliance) is not new, with Sigmund Freud offering a definition as far back as 1912 (Lakke & Meerman 2016), there is increasing evidence of its influence on patients' MSK pain experience (Fuentes et al. 2014; Lakke & Meerman 2016) and outcomes from treatment (Ferreira et al. 2013; Farin et al. 2013); where therapist-effects can be substantial, especially in treatments with a psychosocial emphasis (Lewis et al. 2010). As a result, there have been increasing calls for a more strategic harnessing of 'human technologies' in rehabilitation (Kayes & Mcpherson 2012; Vowles & Thompson 2012).

The framework presented in chapter 4 of this thesis is the result of the most comprehensive conceptualisation process to inform the development of a measure of HCPs' attitudes and beliefs toward MSK pain to date. The framework is the first attempt to synthesise a broad range of components into a coherent schema for the biopsychosocial clinical approach to MSK pain, from the perspective of the MSK clinician. The breadth of the framework is in stark contrast to the narrow conceptual range of many of the existing measures described in chapter 3.

9.2.3 Development and testing of a new biopsychosocial orientation scale

Statements produced by participants in the conceptualisation study were used to develop items for inclusion in a national survey of HCPs, which provided the data for use in the development of a new biopsychosocial orientation scale for the PABS-MSK (chapters 6 and 7). The initial EFA resulted in a 10-item, single factor scale which also produced a reasonable fit in the CFA of data from a separate sample and subsequently demonstrated good test-retest reliability. The results of these analyses were discussed in detail in chapter 7, however there are two key issues which have important implications both for the performance and utility of the biopsychosocial orientation scale, and measurement of clinical orientation more generally, namely; the low communalities and explained variance of the items and extracted factors within the EFA, and poor item response distributions.

Conventionally, extracted factors may be considered of questionable importance if they explain less than 50% of the total and 80% of the common variance in item scores (Floyd & Widaman 1995). The common variance explained by the final single factor solution in this study was 34%, which falls considerably below this level, although it is comparable to that of the two-factor solution (biomedical plus biopsychosocial factors) reported in studies of the existing PABS, where values range from 25.2% (Eland et al. 2016) to 33.4% (Ostelo et al. 2003; Houben et al. 2005). Analyses of item-level data are known to yield low values (Gorsuch 1997), as do those of broad, complex constructs typically found in the social sciences (de Vet et al. 2011). However a further issue to consider is that low values of communality and explained variance may also be indicative of a higher order, or hierarchical factor structure (Gorsuch 1997; Reise et al. 2000).

Hierarchical structural models include inter-correlated primary (or first-order) latent variables and at least one higher, or second-order, latent variable which represent more general theoretical relationships (Baldwin et al. 2005). Items included in the model correlate with both their primary and higher-order constructs (Gorsuch 1997; Hair et al. 2006). Constructs which can be modelled at different levels of abstraction or 'bandwidth' (Hogan & Roberts 1996; Hair et al. 2006) are common in the psychological literature (Clark & Watson 1995; Reise et al. 2000; Musek 2007). However the utility and relative merits of conceptualising and measuring constructs - such as personality - at a higher, more abstracted level or at a lower order with potentially greater precision remains the subject of debate (John & Benet-Martínez 2000). It has been argued that while broad, conceptually complex constructs offer a useful means of summarising information for the purposes of communication, they may compromise the precision of measurement by attempting to incorporate characteristics that in practice are better represented as key correlates (McGrath 2005). However, Reise et al (2000) suggest that measures of a strong higher-order factor can provide a good indication of a trait, despite containing several smaller factors.

Given that the items for the new biopsychosocial scale were derived from a broad, multi-domained conceptual framework, it would be entirely feasible that analysis of a larger pool of items derived from the framework would demonstrate a hierarchical factor structure. In light of this, the new 10-item, single factor scale certainly falls into the category of a higher order, broad bandwidth representation of the construct. This level of abstraction may well capture sufficient information about the biopsychosocial clinical orientation to be useful in many contexts; although this will need to be established in future validation

studies of the new scale. However, it may not provide the precision required in other investigative contexts which might be better served by a larger, multi-dimensional measure, or a battery of measures. This issue is discussed further in section 9.5

The poor response distribution of many of the new biopsychosocial items resulted in a scale with a very high mean score and low variance. The implications of this in terms of the potential for a ceiling effect, poor responsiveness and poor discriminative ability were discussed in chapter 8 (section 8.6.2.2). While the extent of these potential problems will need to be determined in future research studies with longitudinal designs that attempt to change HCPs' attitudes, comparison of the characteristics of the test-retest and baseline samples (section 8.5.1) is suggestive of impaired discrimination. Differences between the two survey responder groups, which may be anticipated to hold somewhat different attitudes, were observed for scores on both the existing PABS subscales. However, there was no difference observed between the groups on the new biopsychosocial scale. This was not an a priori hypothesis test (de Vet et al. 2011), however it does suggest that this is an issue which requires further investigation beyond this programme of research.

9.2.4 Psychometric testing of generic version of biomedical scale

The generic version of the PABS biomedical scale adapted and tested in this programme of work has demonstrated adequate levels of structural validity, internal consistency and test-retest reliability comparable with all previous versions of the scale (see chapter 7 and 8). Although the scale will require further iterative validation, this initial testing provides support for the biomedical scale of the PABS, and for this generic version (PABS-MSK).

As discussed in chapter 7 (section 7.6.3) the results of this study suggest that the PABS biomedical scale could now be standardised as 10 items. This would avoid further

proliferation of different versions of the scale and allow more meaningful comparison between studies.

9.3 Strengths and limitations of the research within this thesis

9.3.1 Strengths

The systematic scale development process presented in this thesis consisted of a series of linked stages. Each stage was designed, conducted, analysed and reported in accordance with recognised guidelines and recommendations (Mokkink, Terwee, Patrick, et al. 2010; de Vet et al. 2011; Mokkink et al. 2012). In order to address the recognised limitations in the development of the existing measures of HCPs' attitudes and beliefs (see chapter 3), particular emphasis was placed on developing a comprehensive and rigorous conceptual framework, involving key stakeholders throughout the process and undertaking both EFA and CFA.

The concept mapping study reported in chapter 4 is the most rigorous conceptualisation process undertaken in the development of a measure of HCPs' attitudes and beliefs toward MSK pain to date. The grounded nature of the concept mapping method mitigated the risk of the construct-under representation (Messick 1994) observed in existing measures and which may occur when relying on existing literature and tools (Buchbinder et al. 2011). The inclusion of a number of elements which have been recognised as being neglected in biopsychosocial practice and research to date (as discussed in chapter 4, section 4.8.1), demonstrates that this relatively novel method has provided a more comprehensive and contemporary conceptual framework.

The involvement of a range of clinical stakeholders throughout this programme of work maximises the validity and utility of both the resultant measure and the preceding

conceptual framework. The importance of the conceptualisation being grounded in the clinical perspective was highlighted by the findings of the scoping review of constructs used in the quantification of HCPs' attitudes and beliefs to date (chapter 3). A marked difference was found in the nature of items derived from existing patient measures, which formed the majority of items extracted from formal measures, and those developed with HCP involvement, or expressed in qualitative studies of HCPs' attitudes and beliefs (see chapter 3, section 3.5.6). The purposive recruitment of HCPs from different professional backgrounds, clinical and academic settings and countries ensured the broad applicability of the resultant framework. The inclusion in the national survey (chapter 6) of GPs, chiropractors and physiotherapists ensures that the PABS-MSK is valid for future use and testing in these three professional groups, as well as the potential for testing in a wider range of MSK HCPs.

Finally, the data collection survey was designed to provide sufficient data to conduct both EFA and CFA in the development of the new biopsychosocial scale. EFA is advocated in the early, developmental stages of scale development, however CFA is considered the more appropriate test of a proposed structure (de Vet et al. 2011); although it has been rarely applied in the development of measures of HCPs' attitudes and beliefs to date. Furthermore, this study was the first to examine the structural validity of the existing biomedical scale using CFA.

9.3.2 Limitations

Despite the concerted effort applied to conducting a rigorous scale development process, the response distribution of the resultant biopsychosocial orientation scale was found to be skewed. This outcome was unsurprising in the context of the general trend towards

high levels of agreement observed with a substantial proportion of the new biopsychosocial items, which was discussed in chapter 7 (section 7.6.1.1). The process of selecting and developing candidate items was informed by a series of pragmatic choices (see chapter 5), the cumulative effect of which has been the development of items which appear to have been difficult for HCPs in this study to disagree with. When reflecting on this process, there are three key decisions which may have contributed to this result.

Firstly, the new conceptual framework comprised nearly 200 potential scale items, grounded in the ideas and terminology of the expert HCP groups. However, as described in chapter 5, section 5.4.1, including all or even half of these in the survey instrument would have been impractical and the cost prohibitive. Therefore, a priori criteria were established for the selection of statements for development into candidate scale items. These included the requirement for statements to have a high average importance rating and to have been identified as representative of the framework's domains by two of the three investigators. The utilisation of the statements considered most important by participants was both the most logical approach and was that employed in previous studies using concept mapping within a scale development process (Wallace et al. 2013). In earlier studies of the PABS, it was suggested that items which elicit extreme levels of agreement might be particularly close to well established practice guidelines and therefore more prone to social desirability response bias (Ostelo et al. 2003; Houben et al. 2005; Eland et al. 2016). It is possible that prioritising the statements rated as most important by participating HCPs resulted in the selection of the most quintessential biopsychosocial statements. The high levels of agreement observed with these items are either expression of HCPs' true beliefs, or a result of social desirability response bias given that HCPs want to be seen to agree with these

items, or a combination of both. Unfortunately, the research programme had not anticipated this result and on reflection, additional methods such as 'think aloud' interviews with a sample of HCPs completing the survey may have been helpful to provide greater understanding for the reasons behind the responses.

Secondly, to remain true to the grounded nature of the group statement generation within the concept mapping method, retention of the participant's meaning was prioritised (Sim & Wright 2000). Therefore, as much of the original statement wording as possible was retained during its conversion to a candidate scale item. In concept mapping, participants are encouraged to develop uni-conceptual statements and as a result many lacked the context, or frame of reference required of a scale item (Nunnally & Bernstein 1994). In attempting to provide this in a manner consistent with the existing PABS items, the vehicles of hypothetical clinical behaviour and beliefs about prognosis or outcome were heavily drawn upon. This somewhat simplistic approach may have compounded the tendency for high levels of agreement.

Thirdly, and perhaps most crucially, the propensity for agreement with the items may well have been exposed and thus addressed by more substantial pilot testing prior to the national survey. The items were reviewed for clarity and meaning by an expert group of the original concept mapping participants and amendments made in response to their feedback. The members of this group did not respond to the items themselves and therefore the extent of likely agreement was unknown. Given the time period within which the national survey needed to be conducted, as previously described and discussed in chapters 6 and 7, it was not possible to have a separate pilot survey prior to the main survey.

The implications of the new biopsychosocial scale's poor response distribution for its performance and utility were discussed in chapter 7, section 7.6.3. However, the extent to which these may be problematic will require further investigation.

9.4 Implications for clinical practice and HCP education

A substantial component of, and output from, this work has been the development of a new conceptual framework for the biopsychosocial clinical approach to MSK pain. The framework provides a versatile and contemporary representation of expert opinion and has broad utility beyond the scope of this scale development process, not least for clinicians and educators.

Theoretical frameworks can provide a useful structure on which to organise learning and to guide clinical decision making (Foster & Delitto 2011). However, the focus of many frameworks to date has been on either integrating, or 'bolting-on', psychosocial elements to existing predominantly biomedical clinical practice or in developing biopsychosocial interventions for specific MSK pain presentations (Sullivan et al. 2006; Main & George 2011; Sowden et al. 2012). While these developments may have proved valuable in terms of introducing psychosocial concepts to MSK clinicians, they may have also contributed to the compartmentalisation or incomplete operationalisation of the biopsychosocial model (Blyth et al. 2007; Pincus et al. 2013). By developing a grounded conceptual framework, this work offers clinicians and educators a much more comprehensive framework with which to operationalise the biopsychosocial clinical approach to MSK pain.

In particular, the bio-clinical domain within the framework reflects a modern understanding of pain and the multi-factorial nature of its generation and experience (Apkarian et al. 2005; Flor 2012; Flor & Turk 2015). This is the antithesis of the structural-

pathological premise on which much of current education and practice continues to be based (Foster & Delitto 2011; Zusman 2013; Moseley & Butler 2015). Attempting to integrate psychosocial elements with an incompatible biomedical element is potentially confused and confusing; not just for clinicians but also for their patients. Patients routinely report receiving mixed messages about their MSK pain from HCPs, explanations that change over time or vary dependent on the location of the pain (Darlow et al. 2014; Darlow et al. 2015). To address this, operationalisation of the biopsychosocial approach needs to be conceptually coherent and consistent across all MSK pain conditions and time points.

The framework includes elements of the approach widely neglected by clinicians who may feel they fall outside their professional remit or for which they do not have the knowledge or skills to address (Gray & Howe 2013; Synnott et al. 2015; Alexanders et al. 2014). These include the wide range of social factors included in the framework. Clearly, issues such as a patient's financial situation or physical environment are not within an MSK clinician's direct sphere of influence, yet they may impact on an individual's access to, and potential outcome from, treatment (Lowe et al. 2014). However, an inability to directly influence an issue does not preclude the ability or necessity to question, acknowledge, discuss, and adapt treatment or services accordingly.

A degree of apprehension also surrounds MSK clinicians addressing psychological elements of a patient's presentation in their practice. It has been suggested that the small treatment effect sizes observed in many trials of psychosocial interventions is due to "watered-down interventions" delivered by HCPs other than psychologists (Pincus & McCracken 2013). However, it has also been demonstrated that with adequate training and support, MSK HCPs can deliver effective psychosocial interventions (Hill et al. 2011; Bryant et al. 2014)

and feel confident in doing so (Sanders et al. 2011; Synnott et al. 2016). In light of these findings, addressing issues of training, competency and treatment fidelity, as for any trial or intervention, may prove more beneficial than professional 'ring-fencing'. The vast majority of patients with common MSK conditions are managed in primary care, and it is important in this setting to be able to differentiate between the normal psychological processes associated with experiencing pain and which are linked to an increased risk of disability (Linton & Shaw 2011) and psychological pathology. Psychological risk or prognostic factors may pre-exist the onset of MSK pain (Werner et al. 2005), and should be acknowledged within treatment in the same way as other prognostic factors such as an individual's home or work situation (Laisné et al. 2012). Similarly, psychological difficulties beyond the scope of the clinician or service would be the preserve of an appropriate clinical specialist, as would any pathological state which required further investigation or intervention such as severe radiculopathy or cauda equina syndrome.

Adequate biopsychosocial clinical education is therefore vital to ensuring clinicians have both the skills and confidence to practice within a biopsychosocial orientation. There has been concern expressed across all MSK healthcare professions about the adequacy of pain science education in both qualifying and postgraduate curricula (Briggs et al. 2014; Hoeger-Bement & Sluka 2015). As a consequence there have been a number of recent attempts to develop recommended core competencies and curricula (Doorenbos et al. 2013; Fishman et al. 2013). A consistent finding across qualitative studies of MSK HCPs is the perceived lack of training, skills, confidence and role clarity with regard to psychological and social dimensions of practice (Jeffrey & Foster 2012; Pastor et al. 2012; Synnott et al. 2015; Driver et al. 2016). As a consequence there is increasing recognition of the need for greater

training in these elements, including the "immeasurables of practice" (Higgs 2010) both on qualifying courses and within continuous professional development (Driver et al. 2016).

However, it is not just the taught elements of clinical training programmes which fail to provide adequate preparation for biopsychosocial MSK practice. In a recent pilot study Etherton and Waterfield (2015) describe clinical educators actively 'gate keeping' opportunities for students to gain experience of working with patients perceived to be complex. This practice not only denies students educational opportunities, but also risks perpetuating the 'separateness' of the biopsychosocial approach and the belief that it is in some way more difficult than 'normal' clinical practice or only applicable in extreme cases.

The biopsychosocial conceptual framework developed in this thesis should be helpful for those involved in the development of MSK educational curricula or clinical competencies. It also provides a clear guide to help HCPs to reflect on their practice and identify their training needs. Furthermore, the framework equips healthcare service providers with a more comprehensive picture of biopsychosocial MSK clinical practice and thus could help better inform future health service design and support HCPs to deliver biopsychosocial MSK healthcare.

9.5 Recommendations and considerations for future research

While the conceptual framework for the biopsychosocial clinical approach was developed as part of this scale development process, it offers great potential in its own right. The framework provides an underpinning structure for developing biopsychosocial research in the field of common MSK pain. The framework has confirmed the expanded boundaries of biopsychosocial clinical practice. There is currently a resurgence of interest in the non-specific dimensions of clinical practice and how to harness it (Testa & Rossettini 2016; Zou

et al. 2016), and the framework provides the structure for further investigation of these in a systematic and meaningful way.

As discussed previously in chapters 7 and 8 and section 9.2.4 above, as for any newly developed measure, the PABS-MSK will need continuing development and evaluation. However, given that the generic version of the biomedical scale has demonstrated equivalence with all previous versions of the scale, a standardised biomedical scale could now be used to advance the research into HCPs' attitudes and beliefs about common MSK pain more generally. Although the new biopsychosocial scale was developed through a rigorous conceptualisation process which affords confidence in its content validity, the fact that the new biopsychosocial items are likely to require a degree of amendment has been discussed in chapter 7 (sections 7.6.1.1 and 7.6.3). This will be a necessary stage of development to fulfil the potential of the PABS-MSK.

In addition to the more specific requirements for further testing of the PABS-MSK and potential refinement of the new biopsychosocial scale, the work undertaken in this thesis highlights a number of more fundamental considerations pertinent to the study of HCPs' attitudes and beliefs. It was recognised at the outset that the biopsychosocial approach was a complex construct, which had been potentially over-simplified in the operationalisation of HCPs' attitudes in this area of study to date. This complexity, and the difficulties it presents for measurement, remains extremely challenging. It also makes it all the more important to develop clarity with regard to the nature and composition of clinical orientation – which, as identified in chapter 3, has not been achieved in this area of study to date - and then ensure consistency in the terminology used to describe it.

The potential that the new 10-item, single factor biopsychosocial scale provides a broad bandwidth, or 'higher order' measurement of a complex (hierarchical) construct was discussed in sections 7.6.1 and 9.2.3. One implication of this is that the new biopsychosocial and existing biomedical scale are not operating at the same level of abstraction. The biomedical scale captures a much narrower, specific dimension of attitude concerning the nature of MSK pain and does not include any of the wider aspects of clinical orientation included in the conceptualisation of the biopsychosocial scale. This more precise level of measurement might be more consistent with a more detailed approach to the measurement of clinical orientation. However to evaluate the wider aspects of clinical orientation captured in the new biopsychosocial scale, the biomedical PABS scale would need to be partnered with additional scales or measures of the different aspects of orientation.

The nature of clinical practice was conceptualised in this way by Thomson et al. (2014), who present a theory of 'conception of practice' informed by five factors: view of health and disease, educational experience, epistemology of practice knowledge, theory-practice relationship and practitioner's perceived therapeutic role. In this model the distinction between biomedical and biopsychosocial beliefs is confined to the 'view of health and disease' factor. In this way, clinical orientation is operationalised as a cluster of traits, both personal or relational and clinical. Operationalising clinical orientation in this way provides the scope to examine both biomedically and biopsychosocially oriented clinicians in equal depth. This approach would allow investigation of the relationships between the different facets of orientation, both with each other and other variables such as clinical behaviour,

patient satisfaction and outcome. In this way, any particularly active component(s) of clinical orientation could be identified.

To a large extent where to strike the balance between the bandwidth and precision of a measure depends on its intended purpose (Hair et al. 2006) and the research questions it will be used to address. However researchers using the new, generic PABS-MSK will need to be aware that the two scales currently capture different levels of abstraction. This has implications for any associated behavioural measures which will need to capture either general, aggregated clinical behaviours or more specific elements of practice to ensure congruence with the chosen level of attitude measurement (Ajzen & Fishbein 2005). Given the functionality of the biomedical PABS scale, including in its adaption for use in studies of all common MSK pain described in this thesis; researchers in this area may also wish to consider using the scale alongside measures of the other elements of clinical orientation identified in this programme of work.

9.6 Conclusions

The programme of research described in this thesis identified the poor quality of previous measures of HCPs' attitudes and beliefs towards MSK pain and the limited conceptualisation of the biopsychosocial approach to MSK clinical practice. A concept mapping approach was used to develop a new conceptual framework for HCPs' biopsychosocial clinical orientation to common MSK pain. In addition to its contribution within the scale development process, this framework demonstrated the complexity of the biopsychosocial approach and provides educators, researchers and clinicians with a contemporary, comprehensive understanding of the biopsychosocial clinical approach to MSK pain which can inform curriculum development, clinical practice and policy. This

research has also led to the development and preliminary testing of a new generic version of the PABS (the PABS-MSK). It is the most comprehensively developed measure of HCPs' attitudes and beliefs concerning MSK pain to date. The structural validity, internal consistency and test-retest reliability of the generic biomedical and biopsychosocial scales were confirmed and while both scales require further validation, the research provides a solid conceptual grounding for further amendments of the measure. This may include research to improve the response distribution of the biopsychosocial scale.

References

Abdel Shaheed, C. et al., 2015. The effects of educational interventions on pharmacists' knowledge, attitudes and beliefs towards low back pain. *International Journal of Clinical Pharmacy*, 37(4), pp.616–25.

Abdulaziz, K. et al., 2015. National survey of physicians to determine the effect of unconditional incentives on response rates of physician postal surveys. *BMJ Open*, 5(2), p.e007166.

Adelson, J.L. & McCoach, D.B., 2010. Measuring the mathematical attitudes of elementary students: The effects of a 4-point or 5-point Likert-type scale. *Educational and Psychological Measurement*, 70(5), pp.796–807.

Ajzen, I., 2005. *Attitudes, Personality and Behavior (2nd Edition)*. Open University Press

Ajzen, I., 1991. The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), pp.179–211.

Ajzen, I., & Fishbein, M. 2005. The influence of attitudes on behaviour. In D. Albarracín, B. T. Johnson, & M. P. Zanna (Eds.), *The Handbook of Attitudes* (pp. 173-221). Mahwah, NJ: Erlbaum.

Alexanders, J., Anderson, A. & Henderson, S., 2014. Musculoskeletal physiotherapists' use of psychological interventions : A systematic review of therapists' perceptions and practice. *Physiotherapy*, 101(2), pp 95-102

Alonso, Y., 2004. The biopsychosocial model in medical research: The evolution of the health concept over the last two decades. *Patient Education and Counseling*, 53(2), pp. 239-244

Altman, D., 1991. *Practical Statistics for Medical Research*, London: Chapman and Hall.

Altman, D.G. et al., 2013. *Statistics with confidence: Confidence intervals and statistical guidelines*, John Wiley & Sons, Ltd.

Apkarian, A.V. et al., 2005. Human brain mechanisms of pain perception and regulation in health and disease. *European Journal of Pain*, 9(4), pp.463–84.

Arksey, H. & O'Malley, L., 2005. Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology*, 8(1), pp.19–32.

Armstrong, D. & Ashworth, M., 2000. When questionnaire response rates do matter: A survey of general practitioners and their views of NHS changes. *British Journal of General Practice*, 50(455), pp.479–480.

Armstrong, J.S. & Overton, T.S., 1977. Estimating nonresponse bias in mail surveys. *Journal of Marketing*, 14(3), pp.396–402.

Armstrong, R. et al., 2011. Cochrane Update. “Scoping the scope” of a cochrane review. *Journal of Public Health*, 33(1), pp.147–50.

Artus, M. et al., 2010. Low back pain symptoms show a similar pattern of improvement following a wide range of primary care treatments: A systematic review of randomized clinical trials. *Rheumatology*, 49(12), pp.2346–56.

Asch, D.A., Jedrziewski, M.K. & Christakis, N.A., 1997. Response rates to mail surveys published in medical journals. *Journal of Clinical Epidemiology*, 50(10), pp.1129–1136.

Aveyard, H., 2010. *Doing a literature review in health and social care: A practical guide (*2nd Edition)., Maidenhead: Open University Press.

Balagué, F. et al., 2012. Non-specific low back pain. *The Lancet*, 379(9814), pp.482–91.

Baldwin, K.A. et al., 2005. Higher-order factor analysis of an instrument with dichotomous data. *Research in Nursing & Health*, 28(5), pp.431–40.

Baraldi, A.N. & Enders, C.K., 2010. An introduction to modern missing data analyses. *Journal of School Psychology*, 48(1), pp.5–37.

Barlow, S. & Stevens, J., 2014. Australian physiotherapists and their engagement with people with chronic pain: Do their emotional responses affect practice? *Journal of Multidisciplinary Healthcare*, 7, pp.231–237.

Barnett-Page, E. & Thomas, J., 2009. Methods for the synthesis of qualitative research: A critical review. *BMC Medical Research Methodology*, 9, p.59.

Batterham, R. et al., 2002. Construction of a GP integration model. *Social Science and Medicine*, 54, pp.1225–1241.

Batterham, R., 1996. Determination of high quality long-term outcomes for people with disabiling conditions. *Working paper (Centre for Health Program Evaluation (Australia));* 55.

Beales, D. et al., 2016. Association between the 10 item Örebro musculoskeletal pain screening questionnaire and physiotherapists’ perception of the contribution of biopsychosocial factors in patients with musculoskeletal pain. *Manual Therapy*.23. pp48-55.

Beales, D. et al., 2015. Current practice in management of pelvic girdle pain amongst physiotherapists in Norway and Australia. *Manual Therapy*, 20(1), pp.109–116.

Beaton, D.E. et al., 2000. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine*, 25(24), pp.3186–91.

Beddow, A., 2010. Physiotherapy Workforce Review. Centre for Workforce Intelligence. Retrieved from *https://www. google. com. au/url*.

Beneciuk, J.M. & George, S.Z., 2015. Pragmatic implementation of a stratified primary care model for low back pain management in outpatient physical therapy settings: Two-phase, sequential preliminary study. *Physical Therapy*, 95(8), pp.1120–34.

Bentler, P.M., 1990. Comparative fit indexes in structural models. *Psychological Bulletin*, 107(2), pp.238–246.

Bergman, S., 2007. Management of musculoskeletal pain. *Best Practice and Research: Clinical Rheumatology*, 21(1), pp.153–166.

Bishop, A. et al., 2016. Current management of pregnancy-related low back pain: A national cross-sectional survey of UK physiotherapists. *Physiotherapy*, 102(1), pp.78–85.

Bishop, A. et al., 2008. How does the self-reported clinical management of patients with low back pain relate to the attitudes and beliefs of health care practitioners? A survey of UK general practitioners and physiotherapists. *Pain*, 135(1–2), pp.187–195.

Bishop, A., Thomas, E. & Foster, N.E., 2007. Health care practitioners' attitudes and beliefs about low back pain: A systematic search and critical review of available measurement tools. *Pain*, 132(1-2-101).

Blyth, F.M., Macfarlane, G.J. & Nicholas, M.K., 2007. The contribution of psychosocial factors to the development of chronic pain: The key to better outcomes for patients? *Pain*, 129, pp.8–11.

BMJ 2015. Internet use by patients and other stories. Available at: http://www.bmj.com/content/350/bmj.h811/article-info

Bolt, E.E., van der Heide, A. & Onwuteaka-Philipsen, B.D., 2014. Reducing questionnaire length did not improve physician response rate: A randomized trial. *Journal of Clinical Epidemiology*, 67(4), pp.477–81.

van Bon-Martens, M.J.H. et al., 2014. Concept mapping as a promising method to bring practice into science. *Public Health*, 128(6), pp.504–14.

Bornmann, L. & Mutz, R., 2015. Growth rates of modern science: A bibliometric analysis based on the number of publications and cited references. *Journal of the Association for Information Science and Technology*, 66(11), pp.2215–2222.

Bourque, L.B. & Fielder, E.P., 2003. *How to Conduct Self-Administered and Mail Surveys* (2nd Edition). London: Sage Publications Inc.

Bowey-Morris, J., Purcell-Jones, G. & Watson, P.J., 2010. Test-retest reliability of the pain attitudes and beliefs scale and sensitivity to change in a general practitioner population. *Clinical Journal of Pain*, 26(2), pp.144–153.

Bowling, A., 2014. *Research Methods in Health* (4th Edition). Maidenhead: Open University Press.

Breivik, H. et al., 2006. Survey of chronic pain in Europe: Prevalence, impact on daily life, and treatment. *European Journal of Pain*, 10(4), pp.287–333.

Breivik, H., Eisenberg, E. & Brien, T.O., 2013. The individual and societal burden of chronic pain in Europe: The case for strategic prioritisation and action to improve knowledge and availability of appropriate care. *BMC Public Health 13:1229*

Brick, J. & Kalton, G., 1996. Handling missing data in survey research. *Statistical Methods in Medical Research*, 5(3), pp.215–238.

Briggs, A.M. et al., 2010. Health literacy and beliefs among a community cohort with and without chronic low back pain. *Pain*, 150(2), pp.275–83.

Briggs, A.M. et al., 2015. Models of care for musculoskeletal health: A cross-sectional qualitative study of Australian stakeholders' perspectives on relevance and standardised evaluation. *BMC Health Services Research 15:509*, pp.1–13.

Briggs, A.M. et al., 2014. Models of care for musculoskeletal health in Australia: Now more than ever to drive evidence into health policy and practice. *Australian Health Rev*iew. Sep;38(4), pp 401-5

Briggs, A.M., et al., 2016. Musculoskeletal health conditions represent a global threat to healthy aging: a report for the 2015 World Health Organization World Report on Ageing and Health. *The Gerontologist*, *56*(Suppl_2), pp.S243-S255.

Briggs, E.V. et al., 2011. Survey of undergraduate pain curricula for healthcare professionals in the United Kingdom. *European Journal of Pain*, 15(8), pp.789-95.

Briggs, T., 2012. Getting it right first time: Improving the quality of orthopaedic care within the National Health Service in England. Available at: http://www.gettingitrightfirsttime.com/downloads/GIRFT-National-Report.pdff

British Society for Rheumatology, 2010. *BSR Response to NHS White Paper - "Equity and Excellence: Liberating the NHS,"*

Browne, M.W. & Cudeck, R., 1992. Alternative ways of assessing model fit. *Sociological Methods & Research*, 21(2), pp.230–258.

Bryant, C. et al., 2014. Can physical therapists deliver a pain coping skills program? An examination of training processes and outcomes. *Physical Therapy*, 94(10).pp 1443-54

Bryman, A., 2008. *Social Research Methods* (3rd Edition). Oxford University Press.

Buchbinder, R. et al., 2011. A validity-driven approach to the understanding of the personal and societal burden of low back pain: Development of a conceptual and measurement model. *Arthritis Research & Therapy*, 13(5), p.R152.

Buchbinder, R. et al., 2013. Placing the global burden of low back pain in context. *Best Practice & Research. Clinical Rheumatology*, 27(5), pp.575–89.

Buchbinder, R., Jolley, D. & Wyatt, M., 2001. 2001 Volvo Award winner in clinical studies: Effects of a media campaign on back pain beliefs and its potential influence on management of low back pain in general practice. *Spine*, 26(23), pp.2535–2543.

Buchbinder, R., Staples, M. & Jolley, D., 2009. Doctors with a special interest in back pain have poorer knowledge about how to treat back pain. *Spine*, 34(11), pp.1218–1228.

Burke, J.G. et al., 2005. An introduction to concept mapping as a participatory public health research method. *Qualitative Health Research*, 15(10), pp.1392–1410.

Busija, L., Buchbinder, R. & Osborne, R.H., 2013. A grounded patient-centered approach generated the personal and societal burden of osteoarthritis model. *Journal of Clinical Epidemiology*, 66(9), pp.994–1005.

Button, K. et al., 2016. Musculoskeletal care pathways for adults. *Systematic Reviews* 5 (128), pp.1-6.

Byrne, B.M., 2005. Factor analytic models: Viewing the structure of an assessment instrument from three perspectives. *Journal of Personality Assessment*, 85(1), pp.17–32.

Byrne, B.M., 2009. *Structural Equation Modeling with AMOS : Basic Concepts, Applications, and Programming* (2nd Edition). Routledge

Campbell, P. et al., 2013. Conceptual overlap of psychological constructs in low back pain. *Pain*, 154(9), pp.1783-91.

Caracelli, V.J. & Riggin, L.J.C., 1994. Mixed-method evaluation: Developing quality criteria through concept mapping. Mixed-method collaboration. *Evaluation Practice*, 15(2), pp.139–152.

Carroll, L.J. et al., 2009. Course and prognostic factors for neck pain in workers. Results of the bone and joint decade 2000-2010 task force on neck pain and its associated disorders. *Journal of Manipulative and Physiological Therapeutics*, 32(2 Suppl.).

Centre for Reviews and Dissemination, 2009. *Systematic reviews: CRD's guidance for undertaking reviews in health care.*

Chartered Society of Physiotherapy, 2012. *Health and Social Care Bill - Lords Report Stage briefing: Impact of NHS reforms on musculoskeletal physiotherapy February 2012.*

Cherkin, D.C., MacCornack, F.A. & Berg, A.O., 1988. Managing low back pain - a comparison of the beliefs and behaviors of family physicians and chiropractors. *Western Journal of Medicine*, 149(4), pp.475–480.

Chew-Graham, C. & May, C., 1999. Chronic low back pain in general practice: The challenge of the consultation. *Family Practice*, 16(1), pp.46-49

Cho, Y.I., Johnson, T.P. & Vangeest, J.B., 2013. Enhancing surveys of health care professionals: A meta-analysis of techniques to improve response. *Evaluation & the Health Professions*, 36(3), pp.382–407.

Christison, G.W., Haviland, M.G. & Riggs, M.L., 2002. The medical condition regard scale: Measuring reactions to diagnoses. *Academic Medicine: Journal of the Association of American Medical Colleges*, 77(3), pp.257–262.

Cicchetti, D. V, 1994. Guidelines, criteria, and rules of thumb for evaluating normed and standardized assessment instruments in psychology. *Psychological Assessment*, 6(4), pp.284–290.

Clark, L.A. & Watson, D., 1995. Constructing Validity : Basic issues in objective scale development. *Psychological Assessment*, 7(3), pp.309–319.

Colquhoun, H.L. et al., 2014. Scoping reviews : Time for clarity in definition, methods and reporting. *Journal of Clinical Epidemiology*, 67(12), pp.1291–1294.

Conaghan, P.G. & Brooks, P., 2008. How to manage musculoskeletal conditions. *Best Practice and Research: Clinical Rheumatology*, 22(3), pp.387–394.

Cook, D.A. & Beckman, T.J., 2006. Current concepts in validity and reliability for psychometric instruments: Theory and Application. *The American Journal of Medicine*, 119 (2): 166.e7-16

Cook, J. V, Dickinson, H.O. & Eccles, M.P., 2009. Response rates in postal surveys of healthcare professionals between 1996 and 2005: An observational study. *BMC Health Services Research*, 9, p.160.

Corbett, M., Foster, N. & Ong, B.N., 2009. GP attitudes and self-reported behaviour in primary care consultations for low back pain. *Family Practice*, 26(5), pp.359–364.

Costello, A.B. & Osborne, J.W., 2005. Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation*, 10(7), pp.1-9.

Cottrell, E. et al., 2015. Maximising response from GPs to questionnaire surveys: Do length or incentives make a difference? *BMC Medical Research Methodology*, 15(1), p.3.

Cottrell, E., Roddy, E. & Foster, N.E., 2010. The attitudes, beliefs and behaviours of GPs regarding exercise for chronic knee pain: A systematic review. *BMC Family Practice 11 (1), p.4*

Coudeyre, E. et al., 2006. General practitioners' fear-avoidance beliefs influence their management of patients with low back pain. *Pain*, 124(3), pp.330–337.

Crombez, G. et al., 2012. Fear-avoidance model of chronic pain. *Clinical Journal of Pain*, 28(6), pp.475–483.

Cronbach, L.J. & Meehl, P.E., 1955. Construct validity in psychological tests. *Psychological Bulletin*, 52, pp.281–302.

Cross, B. et al., 2014. Fear avoidance beliefs, held by occupational therapists, are associated with treatment recommendations. *British Journal of Occupational Therapy,* 77 (6), pp.304–312.

Cull, W.L. et al., 2005. Response rates and response bias for 50 surveys of pediatricians. *Health Services Research*, 40(1), pp.213–226.

Cummings, S.M., Savitz, L. a & Konrad, T.R., 2001. Reported response rates to mailed

physician questionnaires. *Health Services Research*, 35(6), pp.1347–1355.

Cunningham, C.T. et al., 2015. Exploring physician specialist response rates to web-based surveys. *BMC Medical Research Methodology*, 15(1), p.32.

Curtis, E.A. & Redmond, R.A., 2009. Survey postal questionnaire: Optimising response and dealing with non-response. *Nurse Researcher*, 16(2), pp.76–88.

Dalkilinc, M. et al., 2015. Validity and reliability of Turkish version of the Pain Attitudes and Beliefs Scale for Physiotherapists. *Physiotherapy Theory and Practice*, 31(3), pp.186–193.

Danielsen, K., Iversen, H. & Holmboe, O., 2015. Telephone interviews to assess non-response bias in a postal user experience survey. *European Journal of Public Health*, 25(Suppl 3).

Darlow, B. et al., 2014. Acute low back pain management in general practice: Uncertainty and conflicting certainties. *Family Practice.*, 31(6), pp.723–732.

Darlow, B., 2016. Beliefs about back pain: the confluence of client, clinician and community. *International Journal of Osteopathic Medicine,* 20, pp. 53-61.

Darlow, B. et al., 2015. Easy to harm, hard to heal. *Spine*, 40(11), p.1.

Darlow, B. et al., 2012. The association between health care professional attitudes and beliefs and the attitudes and beliefs, clinical management, and outcomes of patients with low back pain: A systematic review. *European Journal of Pain*, 16(1), pp.3–17.

Darlow, B. et al., 2013. The enduring impact of what clinicians say to people with low back pain. *Annals of Family Medicine*, 11(6), pp.527–534.

Davis, K., Drey, N. & Gould, D., 2009. What are scoping studies? A review of the nursing literature. *International Journal of Nursing Studies*, 46(10), pp.1386–400.

Daykin A.R. & Richardson B., 2004. Physiotherapists' pain beliefs and their influence on the management of patients with chronic low back pain. *Spine*; 29: pp 783-95.

Demmelmaier, I. et al., 2012. Tailored skills training for practitioners to enhance assessment of prognostic factors for persistent and disabling back pain: Four quasi-experimental single-subject studies. *Physiotherapy Theory and Practice*, 28(5), pp.359–72.

Derghazarian, T. & Simmonds, J., 2011. Management of low back pain by physical therapists in Quebec: How are we doing? *Physiotherapy Canada*, 63(4), pp.464–474.

DeVellis, R.F., 2012. *Scale Development: Theory and Applications* (3rd Edition). Los Angeles: Sage.

Dillman, D.A., 2007. *Mail and internet surveys - the tailored design method* (2nd Edition). New York: Wiley.

Dillman, D.A., 1979. *Mail and telephone surveys : The total design method*. Wiley

Dixon-Woods, M. et al., 2005. Synthesising qualitative and quantitative evidence: A review of possible methods. *Journal of Health Services Research & Policy* (September), pp.45–53.

Domenech, J. et al., 2013. Psychometric properties and factor structure of the Spanish version of the HC-PAIRS questionnaire. *European Spine Journal*, 22(5), pp.985–994.

Doorenbos, A.Z. et al., 2013. A blueprint of pain curriculum across prelicensure health sciences programs: One NIH pain consortium center of excellence in pain education (CoEPE) experience. *Journal of Pain*, 14(12), pp.1533–1538.

Dorner, T.E. et al., 2011. The impact of socio-economic status on pain and the perception of disability due to pain. *European Journal of Pain*, 15(1), pp.103–109.

Driver, C. et al., 2016. Knowledge, behaviors, attitudes and beliefs of physiotherapists towards the use of psychological interventions in physiotherapy practice: A systematic review. *Disability and Rehabilitation*, pp.1–13.

Duncan, P. & Stephenson, A., 2011. Dealing with systems and understanding contexts: what it might mean to be a “good health care practitioner". *Journal of Evaluation in Clinical Practice*, 17(5), pp.964–9.

Dunn, K.M., Hestbaek, L. & Cassidy, J.D., 2013. Low back pain across the life course. *Best Practice & Research. Clinical Rheumatology*, 27(5), pp.591–600.

Dykema, J. et al., 2013. Surveying clinicians by web: Current issues in design and administration. *Evaluation & the Health Professions*, 36(3), pp.352–81.

Eagly, A.H. & Chaiken, S., 2007. The advantages of an inclusive definition of attitude. *Social Cognition*, 25(5), pp.582–602.

Eagly, A.H. & Chaiken, S., 1993. The Nature of Attitudes. *The Psychology of Attitudes*, pp.1–21.

Eccleston, C., Morley, S.J. & Williams, A.C., 2013. Psychological approaches to chronic pain management: Evidence and challenges. *British Journal of Anaesthesia*, 111(1), pp.59–63.

Edwards, P.J. et al., 2009. Methods to increase response to postal and electronic questionnaires. *Cochrane Database of Systematic Reviews*, (3).

Edwards, R.R., Sullivan, M.D. & Wasan, A.D., 2016. The role of psychosocial processes in the development and maintenance of chronic pain. *The Journal of Pain*, 17(9), pp.T70–T92.

Eland, N.D., 2013. *Physiotherapists attitudes and beliefs towards common low back pain: Factor structure and internal consistency of the Norwegian version of the PABS-PT (Master thesis)*. The University of Bergen.

Eland, N.D. et al., 2016. The Pain Attitudes and Beliefs Scale for physiotherapists: Dimensionality and internal consistency of the Norwegian version. *Physiotherapy Research International*. 20.

Engel, G.L., 1977. The Need for a New Medical Model: A Challenge for Biomedicine. *Science*. 196(4286):pp 129-36

Engel,. GL., 1979. The biopsychosocial model and the education of health professionals. General hospital psychiatry, 1(2), pp.156-65.

Etherton, J. & Waterfield, J., 2015. Preparing to manage patients in pain. The student perspective: A pilot. *Pain and Rehabilitation - The Journal of Physiotherapy Pain Association*, 38, pp. 27-33(7)

Evans, D.W. et al., 2010. The effectiveness of a posted information package on the beliefs and behaviour of musculoskeletal practitioners: The UK Chiropractors, Osteopaths, and Musculoskeletal Physiotherapists Low back pain ManagemENT (COMPLeMENT) randomized trial. *Spine*, 35(8), pp.858–866.

Evans, J.S.B.T., 2008. Dual-processing accounts of reasoning, judgment, and social cognition. *Annual Review of Psychology*, 59, pp.255–278.

Everitt, B., 1980. *Cluster Analysis* (2nd Edition). New York: Halsted Press.

Fabrigar, L.R. et al., 1999. Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*, 4(3), pp.272–299.

Fadyl, J.K., McPherson, K.M. & Kayes, N.M., 2011. Perspectives on quality of care for people who experience disability. *BMJ Quality & Safety*, 20(1), pp.87–95.

Farin, E., Gramm, L. & Schmidt, E., 2013. The patient-physician relationship in patients with chronic low back pain as a predictor of outcomes after rehabilitation. *Journal of Behavioral Medicine*, 36(3), pp.246–58.

Ferguson, E. & Cox, T., 1993. Exploratory factor analysis: A users' guide. *International Journal of Selection and Assessment*, 1(2), pp.84–94.

Ferreira, M.L. et al., 2010. Factors defining care-seeking in low back pain - A meta-analysis of population based surveys. *European Journal of Pain*, 14(7) e1-7.

Ferreira, P.H. et al., 2013. The therapeutic alliance between clinicians and patients predicts outcome in chronic low back pain. *Physical Therapy*, 93(4), pp.470–8.

Field, A., 2009. *Discovering Statistics Using SPSS* (3rd Edition), London: Sage.

Finestone, H.M. et al., 2000. Chronic pain and health care utilization in women with a history of childhood sexual abuse. *Child Abuse & Neglect*, 24(4), pp.547–556.

Finestone, H.M. et al., 2008. Stress-induced physiologic changes as a basis for the biopsychosocial model of chronic musculoskeletal pain: A new theory ? *Clinical Journal of Pain,* 24(9), pp.767–775.

Fishbein, M. & Ajzen, I. 1975 *Beliefs, attitudes, intentions and behaviour: An introduction to theory and research*. Reading, MA: Addison-Wesley

Fishman, S.M. et al., 2013. Core competencies for pain management: Results of an

interprofessional consensus summit. *Pain Medicine*, 14(7), pp.971–981.

Flor, H., 2012. New developments in the understanding and management of persistent pain. *Curr Opin Psychiatry.* 25(2):pp.109–113.

Flor, H. & Turk, D.C., 2015. *Chronic pain: An integrated biobehavioral approach*, Lippincott Williams and Wilkins.

Floyd, F.J. & Widaman, K.F., 1995. Factor analysis in the development and refinement of clinical assessment instruments. *Psychological Assessment*, 7(3), pp.286–299.

Fordyce, W.E., 1976. *Behavioural methods for chronic pain and illness*, St Louis, MS: CV Mosby.

Foster, N.E., 2007. Beliefs and preferences: Do they help determine the outcome of musculoskeletal problems? *Physical Therapy Reviews*, 12(3), pp.199–207.

Foster, N.E. et al., 2010. Distinctiveness of psychological obstacles to recovery in low back pain patients in primary care. *Pain*, 148(3), pp.398–406.

Foster, N.E. & Delitto, A., 2011. Embedding psychosocial perspectives within clinical management of low back pain: Integration of psychosocially informed management principles into physical therapist practice - challenges and opportunities. *Physical Therapy*, 91(5) pp. 790-803.

Foster, N.E., Hartvigsen, J. & Croft, P.R., 2012. Taking responsibility for the early assessment and treatment of patients with musculoskeletal pain: A review and critical analysis. *Arthritis Research & Therapy*, 14(1), p.205.

Fraley, C. & Raftery, a E., 1998. How many clusters? Which clustering method? Answers via model-based cluster analysis. *The Computer Journal*, 41(8), pp.578–588.

Francke, A.L. et al., 2008. Factors influencing the implementation of clinical guidelines for health care professionals: A systematic meta-review. *BMC Medical Informatics and Decision Making*, 8, p.38.

Froud, R. et al., 2014. A systematic review and meta-synthesis of the impact of low back pain on people's lives. *BMC Musculoskeletal Disorders*, 15, p.50.

Fuentes, J. et al., 2014. Enhanced therapeutic alliance modulates pain intensity and muscle pain sensitivity in patients with chronic low back pain: An experimental controlled study. *Physical Therapy*, 94(4), pp.477–490.

Fullen, B.M. et al., 2008. Doctors' attitudes and beliefs regarding acute low back pain management: A systematic review. *Pain*, 136(3), pp.388–396.

Fullen, B.M. et al., 2011. General Practitioners' attitudes and beliefs regarding the management of chronic low back pain in Ireland: A cross-sectional national survey. *Clinical Journal of Pain*, 27(6), pp.542–550.

Gabe J, et al. 2004 *Key Concepts in Medical Sociology*. Sage Publications, London

Garson, G.D., 2015. Missing values analysis and data imputation. *North Carolina State University. Asheboro, USA: Statistical Associates Publishers*. Available at: http://www.statisticalassociates.com/missingvaluesanalysis_p.pdf.

GCC, 2015. General Chiropractic Council annual report.

Ghasemi, A. & Zahediasl, S., 2012. Normality tests for statistical analysis: A guide for non-statisticians. *International Journal of Endocrinology and Metabolism*, 10(2), pp.486–489.

Glidewell, L. et al., 2012. Do incentives, reminders or reduced burden improve healthcare professional response rates in postal questionnaires? Two randomised controlled trials. *BMC Health Services Research*, 12, p.250.

GMC, 2016. General Medical Council. List of Registered Medical Practitioners.

Goertz, C.M. et al., 2013. Collaborative care for older adults with low back pain by family medicine physicians and doctors of chiropractic (COCOA): Study protocol for a randomized controlled trial. *Trials*, 14, p.18.

Gorsuch, R.L., 1997. Exploratory factor analysis: Its role in item analysis. *Journal of Personality Assessment*. 68 (3), pp. 532-560

Gough, D., Thomas, J. & Oliver, S., 2012. Clarifying differences between review designs and methods. *Systematic Reviews*, 1(1), p.28.

Grabovschi, C., Loignon, C. & Fortin, M., 2013. Mapping the concept of vulnerability related to health care disparities: A scoping review. *BMC Health Services Research*, 13, p.94.

Grant, M.J. & Booth, A., 2009. A typology of reviews: An analysis of 14 review types and associated methodologies. *Health Information and Libraries Journal*, 26(2), pp.91–108.

Gray, H. & Howe, T., 2013. Physiotherapists' assessment and management of psychosocial factors (Yellow and Blue Flags) in individuals with back pain. *Physical Therapy Reviews*, 18(5), pp.379–394.

Greatbatch, D., 2016. A false economy. Cuts to continuing professional development funding for nursing, midwifery and the Allied Health Professions in England. *Council of Deans of Health*.

Gremeaux, V. et al., 2015. Do teaching general practitioners' fear-avoidance beliefs influence their management of patients with low back pain? *Pain practice: The Official Journal of World Institute of Pain*, 15(8), pp.730–737.

Grimshaw, J., 2010. *A knowledge synthesis chapter*. Canadian Institute of Health Research. pp. 1–56.

Guadagnoli, E. & Velicer, W.F., 1988. Relation to sample size to the stability of component patterns. *Psychological Bulletin*, 103(2), pp.265–275.

Guzman, J. et al., 2002. Return to work after occupational injury. Family physicians'

perspectives on soft-tissue injuries. *Canadian Family Physician*, 48(DEC.) pp 1912-1919.

Hackett, K.L. et al., 2015. A concept mapping study evaluating the UK's first NHS generic fatigue clinic. *Health Expectations*. 19(5):pp 1138-49

Hair, J.F. et al., 2006. *Multivariate Data Analysis*, Pearson Prentice Hall.

Halligan, P.W. & Aylward, M., 2006. *The Power of Beilef*, Oxford University Press.

Hancock, M.J. & Maher, C.G., 2011. Discussion paper: What happened to the " bio " in the bio-psycho-social model of low back pain ? *European Spine Journal*, 20, pp.2105–2110.

Hardigan, P.C., Popovici, I. & Carvajal, M.J., 2016. Response rate, response time, and economic costs of survey research: A randomized trial of practicing pharmacists. *Research in Social & Administrative Pharmacy*, 12, pp.141–148.

Hardy, M. & Bryman, A. 2004. *The Handbook of Data Analysis*. London: Sage

Hartvigsen, J., Foster, N.E. & Croft, P.R., 2011. We need to rethink front line care for back pain. *BMJ (Clinical Research Ed.)*, 342, p.d3260.

Hasenbring, M.I., Rusu, A.C. & Turk, D.C., 2012. *From acute to chronic back pain: Risk factors, mechanisms and clinical implications*, Oxford: Open University Press.

Haukenes, I. et al., 2014. Physical health-related quality of life predicts disability pension due to musculoskeletal disorders: seven years follow-up of the Hordaland Health Study Cohort. *BMC Public Health,* 14(167)

Havelka, M., Lucanin, J.D. & Lucanin, D., 2009. Biopsychosocial model-the integrated approach to health and disease. *Collegium Antropologicum*, 33(1), pp.303–10.

Haynes, S.N., Richard, D.C.S. & Kubany, E.S., 1995. Content validity in psychological assessment: A functional approach to concepts and methods. *Psychological Assessment*, 7(3), pp.238–247.

HCPC, 2016. Health Care Professionals Council. http://www.hpc-uk.org/publications/reports/).

Health and Safety Executive, 2016. Costs to Britain of workplace injuries and new cases of work-related ill health. http://www.hse.gov.uk/statistics/cost.htm.

Helasoja, V. et al., 2002. Late response and item nonresponse in the Finbalt Health Monitor survey. *European Journal of Public Health*, 12(2), pp.117–123.

Hendrick, P. et al., 2013. Therapist knowledge, adherence and use of low back pain guidelines to inform clinical decisions--a national survey of manipulative and sports physiotherapists in New Zealand. *Manual Therapy*, 18(2), pp.136–42.

Henschke, N. et al., 2015. The epidemiology and economic consequences of pain. *Mayo Clinic Proceedings*, 90(1), pp.139–147.

Higgins, J.P.T. & Green, S., 2011. *Cochrane handbook for systematic reviews of interventions.* Chichester: Wiley-Blackwell

Higgs, J., 2014. Assessing the immeasurables of practice. *Asia-Pacific Journal of Cooperative Education*, 15(3), pp.251-265.

Hill, J.C. et al., 2011. Comparison of stratified primary care management for low back pain with current best practice (STarT Back): A randomised controlled trial. *The Lancet*, 378(9802), pp.1560–71.

Hill, J.C. & Fritz, J.M., 2011. Psychosocial influences on low back pain, disability and response to treatment. *Physical Therapy*, 91(5), pp.712–721.

Hirsh, A. et al., 2014. Preferences, experience, and attitudes in the management of chronic pain and depression: A comparison of physicians and medical students. *Clinical Journal of Pain*, 30(9), pp.766–774.

Hoeger-Bement, M.K. & Sluka, K. A., 2015. The current state of physical therapy pain curricula in the United States: A faculty survey. *The Journal of Pain*, 16(2), pp.144–152.

Hogan, J. & Roberts, B.W., 1996. Issues and non-issues in the fidelity–bandwidth trade-off. *Journal of Organizational Behavior*, 17(6), pp.627–637.

Hogg-Johnson, S. et al., 2008. The burden and determinants of neck pain in the general population. *European Spine Journal*, 17(Suppl 1), pp.39–51.

Holden, M.A. et al., 2009. UK-based physical therapists' attitudes and beliefs regarding exercise and knee osteoarthritis: Findings from a mixed-methods study. *Arthritis & Rheumatism: Arthritis Care & Research*, 61(11), pp.1511–1522.

Holden, M.A. et al., 2008. Physical therapists' use of therapeutic exercise for patients with clinical knee osteoarthritis in the United kingdom: In line with current recommendations? *Physical Therapy*, 88(10), pp.1109–21.

Hong, J. et al., 2013. Costs associated with treatment of chronic low back pain: An analysis of the UK General Practice Research Database. *Spine*, 38(1), pp.75–82.

Houben, R.M. et al., 2005. Health care providers' orientations towards common low back pain predict perceived harmfulness of physical activities and recommendations regarding return to normal activity. *European Journal of Pain*, 9(2), pp.173–83.

Houben R. M. et al., 2004. Health care providers' attitudes and beliefs towards common low back pain: Factor structure and psychometric properties of the HC-PAIRS. *Clinical Journal of Pain*, 20(1), pp.37-44

Hoy, D. et al., 2010. The epidemiology of low back pain. *Best Practice & Research. Clinical Rheumatology*, 24(6), pp.769–81.

Hoy, D.G. et al., 2014. Reflecting on the global burden of musculoskeletal conditions: Lessons learnt from the Global Burden of Disease 2010 Study and the next steps forward. *Annals of the Rheumatic Diseases* Published Online First: 09 June 2014. doi: 10.1136/annrheumdis-2014-205393

Hu, L. & Bentler, P.M., 1999. Cut-off criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), pp.1–55.

Hutcheson, G. & Sofroniou, N., 1999. *The Multivariate Social Scientist*. Sage

Innes, S.I. et al., 2015. Attitudes and beliefs of Australian chiropractors' about managing back pain: A cross-sectional study. *Chiropractic & Manual Therapies*. 23:17

Ives, J., Damery, S. & Redwod, S., 2013. PPI, paradoxes and Plato: Who's sailing the ship? *Journal of Medical Ethics*, 39(3), pp.181–5.

Jackson, K.M. & Trochim, W.M.K., 2002. Concept mapping as an alternative approach for the analysis of open-ended survey responses. *Organizational Research Methods*, 5(4), pp.307–336.

Jacobs, C.M. et al., 2015. Brief psychologically informed physiotherapy training is associated with changes in physiotherapists' attitudes and beliefs towards working with people with chronic pain. *British Journal of Pain,* 10(1) pp.38-45.

Jaini, P.A. & Lee, J.S., 2015. A Review of 21st Century Utility of a Biopsychosocial Model in United States Medical School Education. *Journal of Lifestyle Medicine*, 5(2), pp.49.

James, L.R., Demaree, R.G. & Wolf, G., 1984. Estimating within-group interrater reliability with and without response bias. *Journal of Applied Psychology*, 69(1), pp.85–98.

Jeffrey, J.E. & Foster, N.E., 2012. A qualitative investigation of physical therapists' experiences and feelings of managing patients with nonspecific low back pain. *Physical Therapy*, 92(2), pp.266–278.

Jellema, P., et al., 2005. Why is a treatment aimed at psychosocial factors not effective in patients with (sub) acute low back pain? *Pain*, 118(3), pp.350-359.

Jenkins, H.J. et al., 2015. Effectiveness of interventions designed to reduce the use of imaging for low-back pain: A systematic review. *Canadian Medical Association Journal,* 187 (6) pp.401–8.

Jensen, M.P., 2011. Psychosocial approaches to pain management: An organizational framework. *Pain*, 152(4), pp.717–25.

Jensen, M.P., Nielson, W.R. & Kerns, R.D., 2003. Toward the development of a motivational model of pain. *Journal of Pain*, 4(9), pp.477–492.

John, O. P. & Benet-Martinez, V. 2000. Measurement: Reliability, construct validation, and scale construction. *Handbook of Research Methods in Social and Personality Psychology*, edited by H.T. Reis and C.M. Judd. New York: Cambridge University Press.

Johnsen, J.A., Biegel, D.E. & Shafran, R., 2000. Concept mapping in mental health: Uses and adaptations. *Evaluation and Program Planning*, 23, pp.67–75.

Jones, M., Edwards, I. and Gifford, L., 2002. Conceptual models for implementing biopsychosocial theory in clinical practice. *Manual Therapy*, 7(1), pp.2-9.

Jordan, K.P. et al., 2010. Annual consultation prevalence of regional musculoskeletal problems in primary care: An observational study. *BMC Musculoskeletal Disorders*, 11, p.144.

Kamper, S.J., et.al., 2015. Multidisciplinary biopsychosocial rehabilitation for chronic low back pain: *Cochrane Database of Systematic Reviews*, 2 (9), pp.1–11.

Kane, M. & Trochim, W.M.K., 2007. *Concept mapping for planning and evaluation*. Sage

Kannus, P. et al., 2003. Basic science and clinical studies coincide: Active treatment approach is needed after a sports injury. *Scandinavian Journal of Medicine & Science in Sports*, 13(3), pp.150–4.

Kass, R.A. & Tinsley, H.E.A., 1979. Factor Analysis. *Journal of Leisure Research*, 11(2), pp.120–138.

Kastner, M. et al., 2011. Understanding the relationship between the perceived characteristics of clinical practice guidelines and their uptake: Protocol for a realist review. *Implementation Science : IS*, 6(1), p.69.

Kastner, M. et al., 2012. What is the most appropriate knowledge synthesis method to conduct a review? Protocol for a scoping review. *BMC Medical Research Methodology*, 12, p.114.

Kayes, N.M. & Mcpherson, K.M., 2012. Human technologies in rehabilitation: "Who" and "How" we are with our clients. *Disability Rehabilitation*, 34(22), pp.1907–1911.

Keefe, F.J., 2011. Behavioral medicine: A voyage to the future. *Annals of Behavioral Medicine: A Publication of the Society of Behavioral Medicine*, 41(2), pp.141–51.

Kendall, N. et al., 2009. *Tackling musculoskeletal problems: A guide for clinic and workplace - identifying obstacles using the psychosocial flags framework*, London: The Stationery Office.

Kendall, N., Linton, S. & Main, C.J., 1997. Guide to assessing psychosocial yellow flags in acute low back pain: Risk factors for long-term disability and work loss. Wellington, New Zealand. *Accident Rehabilitation and Compensation Insurance Corporation of New Zealand and the National Health Committee.*, pp.1–70.

Kernot, J. et al., 2015. Test-retest reliability of the English version of the Edinburgh Postnatal Depression Scale. *Archives of Women's Mental Health*, 18(2), pp.255–257.

Killick, L. & Davenport, T.E., 2014. Pain worlds: Towards the integration of a sociocultural perspective of pain in clinical physical therapy. *Physiotherapy Research International: The Journal for Researchers and Clinicians in Physical Therapy*, 19(4), pp.193–204.

Klabunde, C.N. et al., 2012. Improving the quality of surveys of physicians and medical groups: A research agenda. *Evaluation & the Health Professions*, 35(4), pp.477–506.

Kline, P., 1994. *An Easy Guide to Factor Analysis*, London: Routledge.

Koes, B.W. et al., 2010. An updated overview of clinical guidelines for the management of

non-specific low back pain in primary care. *European Spine Journal*, 19 (12) pp.2075–2094.

Koivula, A., 2016. How much does the mode of response matter? A comparison of web-based and mail-based response when examining sensitive issues in social surveys. In *Third ISA Forum of Sociology*.

Kongsted, A. et al., 2016. Prediction of outcome in patients with low back pain: A prospective cohort study comparing clinicians' predictions with those of the Start Back Tool. *Manual Therapy*, 21, pp.120–127.

Kori, S., Miller, R. & Todd, D., 1990. Kinesiophobia: A new view of chronic pain behavior. *Pain Management*, 3(1), pp.35–43.

Kortteisto, T. et al., 2010. Healthcare professionals' intentions to use clinical guidelines: A survey using the theory of planned behaviour. *Implementation Science*, 5, p.51.

Krosnick, J.A., Charles, M.J. & Wittenbrink, B., 2005. The measurement of attitudes. *The Handbook of Attitudes*, Psychology Press. pp.21–76.

Kruskal, J.B., 1964. Nonmetric multidimensional scaling: A numerical method. *Psychometrika*, 29(2), pp.115–129.

Kruskal, J.B. & Wish, M., 1978. *Multidimensional scaling*, Beverly Hills, CA: Sage.

Laekeman, L.A. Sitter, H. & Basler, H.D., 2008. The Pain Attitudes and Beliefs Scale for physiotherapists: Psychometric properties of the German version. *Clinical Rehabilitation*, 22(6), pp.564–75.

Laisné, F., Lecomte, C. & Corbière, M., 2012. Biopsychosocial predictors of prognosis in musculoskeletal disorders : A systematic review of the literature (corrected and republished) *Disability Rehabilitation*. 34(22), pp.1912–1941.

Lakke, S.E. & Meerman, S., 2016. Does working alliance have an influence on pain and physical functioning in patients with chronic musculoskeletal pain; a systematic review. *Journal of Compassionate Health Care 3:1*.

Latimer, J., Maher, C. & Refshauge, K., 2004. The attitudes and beliefs of physiotherapy students to chronic back pain. *Clinical Journal of Pain*, 20(1), pp.45–50.

Lee, H., 2015. Understanding how pain education causes changes in pain and disability: Protocol for a causal mediation analysis of the PREVENT trial. *Journal of Physiotherapy*. 61(3):156.

Leegaard, M. et al., 2014. Survey of pain curricula for healthcare professionals in Norway. Nordic *Journal of Nursing Research*, 34(1), pp.42-5.

de Leeuw, E.D. & Hox, J.J., 2008. Self-administered questionnaires: Mail surveys and other applications. In E. D. de Leeuw, J. J. Hox, & D. A. Dillman, eds. *International Handbook of Survey Methodology*. New York: Taylor & Francis Group, pp. 239–263.

Légaré, F. et al., 2010. Interventions for improving the adoption of shared decision making

by healthcare professionals. *The Cochrane Database of Systematic Reviews*, (5), p.CD006732.

Levac, D., Colquhoun, H. & Brien, K.K.O., 2010. Scoping studies: Advancing the methodology. *Implementation Science*, 5(69), pp.1–9.

Lewis-Beck, M.S., Bryman, A. & Liao, T.F., 2004. *The SAGE Encyclopedia of Social Science Research Methods*, Sage.

Lewis, M. et al., 2010. Measuring practitioner/therapist effects in randomised trials of low back pain and neck pain interventions in primary care settings. *European Journal of Pain*, 14(10), pp.1033–1039.

Linton, S.J. & Shaw, W.S., 2011. Impact of psychological factors in the experience of pain. *Physical Therapy*, 91(5) pp. 700-11.

Linton, S.J., Vlaeyen, J. & Ostelo, R., 2002. The back pain beliefs of health care providers: Are we fear-avoidant? *Journal of Occupational Rehabilitation*, 12(4), pp.223–233.

Little, R.J.A., 1988. A Test of Missing Completely at Random for Multivariate Data With Missing Values. *Journal of the American Statistical Association,* 83(404), pp.1198-1202.

Loevinger, J., 1957. Objective tests as instruments of psychological theory. *Psychological Reports*, 3, pp.635–694.

Lohr, K.N. et al., 1996. Evaluating quality-of-life and health status instruments: Development of scientific review criteria. *Clinical Therapeutics*. pp. 979–984.

Lohr, S.L., 2008. Coverage and Sampling. In E. d de Leeuw, J. J. Hox, & D. A. Dillman, eds. *International Handbook of Survey Methodology*. New York: Taylor & Francis Group, pp. 97–112.

Loisel, P. et al., 2005. Prevention of work disability due to musculoskeletal disorders: The challenge of implementing evidence. *Journal of Occupational Rehabilitation*, 15(4), pp.507–24.

Lorig, K.R., Cox, T. & Cuevas, Y., 1984. Converging and diverging beliefs about arthritis: Caucasian patients, Spanish speaking patients, and physicians. *Journal of Rheumatology*, 11(1), pp.76–79.

Lowe, A. et al., 2014. Does deprivation influence treatment outcome in physiotherapy? *Physical Therapy Reviews*, 19(4), pp.225–233.

Lowe, D., Taylor, M. & Hill, S., 2016. Changing definitions altered multimorbidity prevalence, but not burden associations, in a musculoskeletal population. *Journal of Clinical Epidemiology*, 78, pp.116–126.

MacCallum, R.C. et al., 1999. Sample size in factor analysis. *Psychological Methods*, 4(1), pp.84–99.

Macfarlane, G.J. et al., 2009. Evaluation of work-related psychosocial factors and regional

musculoskeletal pain: Results from a EULAR Task Force. *Annals of the Rheumatic Diseases*, 68(6), pp.885–891.

Mackenzie, S.B., Podsakoff, P.M. & Podsakoff, N.P., 2011. Construct measurement and validation procedures in MIS and behavioral research: Integrating new and existing techniques. *MIS Quarterly*, 35(2), pp.293–334.

Mackey, L. & Hurley, D.A., 2014. A comparison of physiotherapy students ' and recently graduated physiotherapists ' attitudes and beliefs to patients with chronic low back pain (CLBP) in Ireland – A pilot study. *Physiotherapy Practice and Research*, 35 (2), pp.101–109.

Magalhaes, M.O. et al., 2012. Attitudes and beliefs of Brazilian physical therapists about chronic low back pain: A cross-sectional study. *Brazilian Journal of Physical Therapy*, 16(3), pp.248–253.

Magalhaes, M.O. et al., 2011. Clinimetric testing of two instruments that measure attitudes and beliefs of health care providers about chronic low back pain. *Revista Brasileira De Fisioterapia*, 15(3), pp.249–256.

Magee, D.J., 2014. *Orthopedic Physical Assessment* (6th Edition), Saunders.

Main, C.J., Buchbinder, R., et al., 2010. Addressing patient beliefs and expectations in the consultation. *Best Practice and Research: Clinical Rheumatology*, 24(2), pp.219–225.

Main, C.J., 2013. The importance of psychosocial influences on chronic pain. *Pain Management*, 3(2013), pp.455–66.

Main, C.J., Foster, N. & Buchbinder, R., 2010. How important are back pain beliefs and expectations for satisfactory recovery from back pain? *Best Practice and Research: Clinical Rheumatology*, 24(2), pp.205–217.

Main, C.J. & Linton, S.J., 2013. What really goes on behind closed doors: The need to understand communication about pain. *Scandinavian Journal of Pain*, 4(1), pp.23–24.

Main, C.J., Phillips, C.J. & Watson, P.J., 2008. Secondary prevention in health-care and occupational settings in musculoskeletal conditions focusing on low back pain. In *Handbook of Complex Occupational Disability Claims*. Boston, MA: Springer US, pp. 387–404.

Main, C.J. & Spanswick, C.C., 2000. *Pain Management: An Interdisciplinary Approach*, Edinburgh: Churchill Livingstone.

Main, C.J., Sullivan, M.J.L. & Watson, P.J., 2008. *Pain Management: Practical applications of the biopsychosocial perspective in clinical and occupational settings* (2nd Edition), Elsevier.

Main, J. & George, Z., 2011. Psychologically informed practice for management of low back pain: Future directions in practice and research. *Physical Therapy*, 91(5), pp.820–825.

Mallen, C.D. et al., 2007. Prognostic factors for musculoskeletal pain in primary care: A systematic review. *The British Journal of General Practice : The Journal of the Royal*

College of General Practitioners, 57(541), pp.655–661.

Mannion, A.F., Wieser, S. & Elfering, A., 2013. Association between beliefs and care-seeking behavior for low back pain. *Spine*, 38(12), pp.1016–1025.

March, L. et al., 2014. Burden of disability due to musculoskeletal (MSK) disorders. *Best Practice & Research Clinical Rheumatology*, 28(3), pp.353–366.

Matsunaga, M., 2011. How to factor-analyze your data right: Do's, don'ts, and how-to's. *International Journal of Psychological Research*, 3(1), pp.97–110.

McBeth, J. et al., 2005. Hypothalamic-pituitary-adrenal stress axis function and the relationship with chronic widespread pain and its antecedents. *Arthritis Research & Therapy*, 7(5), pp.R992–R1000.

McGrath, R.E., 2005. Conceptual complexity and construct validity. *Journal of Personality Assessment*, 85(2), pp.112–124.

McLeod, C.C. et al., 2013. Health care provider surveys in the United States, 2000-2010: A review. *Evaluation & the Health Professions*, 36(1), pp.106–26.

McMahon, S.B., et al., 2015. Crosstalk between the nociceptive and immune systems in host defence and disease. *Nature Reviews Neuroscience*, *16*(7), pp.389-402.

Messick, S., 1994. Foundations of validity: Meaning and consequences in psychological assessment. *European Journal of Psychological Assessment*,10(1), pp. 1-9

Michie, S. & Johnston, M., 2008. From theory to intervention: Mapping theoretically derived behavioural determinants to behaviour change techniques. *Applied Psychology*, 57(4), pp.1–32.

Michie, S., Stralen, M.M. Van & West, R., 2011. The behaviour change wheel : A new method for characterising and designing behaviour change interventions. *Implementation Science*, 6(1), p.42.

Miciak, M., Gross, D.P. & Joyce, A., 2012. A review of the psychotherapeutic "common factors" model and its application in physical therapy: The need to consider general effects in physical therapy practice. *Scandinavian Journal of Caring Sciences*, 26(2), pp.394–403.

Miller, W.R. & Rollnick, S., 2012. *Motivational interviewing: Helping people change*, Guilford press.

Moher, D. et al., 2009. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *Annals of Internal Medicine*, 151, pp.264–269.

Mokkink, L.B., Terwee, C.B., Knol, D.L., et al., 2010. The COSMIN checklist for evaluating the methodological quality of studies on measurement properties : A clarification of its content. *BMC Medical Research Methodology 10:22*

Mokkink, L.B. et al., 2012. The COSMIN checklist manual*: VU University Medical Centre, EMGO Institute for Healthcare and Research*.

Mokkink, L.B., Terwee, C.B., Patrick, D.L., et al., 2010. The COSMIN study reached international consensus on taxonomy, terminology, and definitions of measurement properties for health-related patient-reported outcomes. *Journal of Clinical Epidemiology*, 63(7), pp.737–45.

Mokkink, L.B. & Terwee, C.B., 2010. The COSMIN checklist for assessing the methodological quality of studies on measurement properties of health status measurement instruments : An international Delphi study. *Quality of Life Research*. 19(4): pp. 539-49

Moore, R.A., et al., 2014. The costs and consequences of adequately managed chronic non-cancer pain and chronic neuropathic pain. *Pain Practice*, *14*(1), pp.79-94.

Morris D.B. 1998. *Illness and culture in the Postmodern Age*. University of California Press, Los Angeles

Moseley, G.L. & Butler, D.S., 2015. Fifteen years of explaining pain: The past, present and future. *Journal of Pain*, 16(9), pp.807–813.

Moser, C. & Kalton, G., 1985. *Survey methods in social investigation* (2nd Edition), Routledge.

Murphy, M.K. et al., 1998. Consensus development methods, and their use in clinical guideline development. *Health Technol Assess*.;2(3):i-iv, pp1-88

Murray, C.J.L. et al., 2012. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990-2010: A systematic analysis for the Global Burden of Disease Study 2010. *The Lancet*, 380(9859), pp.2197–2223.

Musek, J., 2007. A general factor of personality: Evidence for the Big One in the five-factor model. *Journal of Research in Personality*, 41(6), pp.1213–1233.

Mutsaers, J.H. et al., 2012. Psychometric properties of the Pain Attitudes and Beliefs Scale for physiotherapists: A systematic review. *Manual Therapy*, 17(3), pp.213–8.

Mutsaers, J.H. et al., 2014. The psychometric properties of the PABS-PT in neck pain patients: a validation study. *Manual Therapy*, 19(3), pp.208–14.

Myers, N.D., et al., 2011. Sample Size and Power Estimates for a Confirmatory Factor Analytic Model in Exercise and Sport: A Monte Carlo Approach. Research Quarterly for Exercise and Sport, 82(3), pp. 412–423

National Institute for Health & Care Excellence (NICE) Osteoarthritis. Care and management in adults (clinical guideline; no. 177). London: NICE; 2014. Available at: https://www.ncbi.nlm.nih.gov/pubmed/25340227

Netemeyer, R.G., Bearden, W.O. & Sharma, S., 2003. *Scaling Procedures: Issues and Applications*, London: Sage.

Neuberg, S.L. et al., 1997. On dimensionality, discriminant validity, and the role of psychometric analyses in *Personality Theory and Measurement*: Reply to Kruglanski et

al.'s (1997) Defense of the Need for Closure Scale, (5), pp.1017–1029.

Nicholls, E. et al., 2014. Pain trajectory groups in persons with, or at high risk of, knee osteoarthritis: Findings from the knee clinical assessment study and the osteoarthritis initiative. *Osteoarthritis and Cartilage*, 22(12), pp.2041–2050.

Nunnally, J.C. & Bernstein, I.H., 1994. *Psychometric theory* (3rd Edition). New York: McGraw-Hill.

O'Sullivan, K. et al., 2013. Back pain beliefs among physiotherapists are more positive after biopsychosocially orientated workshops. *Physiotherapy Practice and Research* 34 (1) pp. 37-45.

O'Sullivan, P., 2012. It's time for change with the management of non-specific chronic low back pain. *British Journal of Sports Medicine*, 46(4), pp.224–7.

Office for National Statistics, 2009. Health statistics quarterly. *No. 41*.

Oostendorp, R.A.B. et al., 2015. Manual physical therapists' use of biopsychosocial history taking in the management of patients with back or neck pain in clinical practice. *The Scientific World Journal, Vol 2015.*

Osborne, J.W. & Costello, A.B., 2009. Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Pan-Pacific Management Review*. 12 (2) pp.131-146

Osborne, R.H. et al., 2011. Development and validation of the influenza intensity and impact questionnaire (FluiiQ). *Value in Health*, 14(5), pp.687–699.

Osborne, R.H. et al., 2013. The grounded psychometric development and initial validation of the Health Literacy Questionnaire (HLQ). *BMC Public Health*, 13, p.658.

Osborne, R.H., Elsworth, G.R. & Whitfield, K., 2007. The Health Education Impact Questionnaire (heiQ): An outcomes and evaluation measure for patient education and self-management interventions for people with chronic conditions. *Patient Education and Counseling*, 66 (2), pp.192–201.

Ostelo, R.W.J. et al., 2003. Health care provider's attitudes and beliefs towards chronic low back pain: The development of a questionnaire. *Manual Therapy*, 8(4), pp.214–223.

Outcalt, S.D. et al., 2015. Chronic pain and comorbid mental health conditions: Independent associations of posttraumatic stress disorder and depression with pain, disability, and quality of life. *Journal of Behavioral Medicine*, 38(3), pp.535–543.

Overmeer, T. et al., 2009. Do physical therapists change their beliefs, attitudes, knowledge, skills and behaviour after a biopsychosocially orientated university course? *Journal of Evaluation in Clinical Practice*, 15(4), pp.724–732.

Palazzo, C. et al., 2014. The Burden of Musculoskeletal Conditions. *PLoS ONE*, 9(3): e90633.

Parry, R.H. & Brown, K., 2009. Teaching and learning communication skills in physiotherapy: What is done and how should it be done? *Physiotherapy*, 95 (4), pp.294–301.

Parsons, S. et al., 2007. Prevalence and comparative troublesomeness by age of musculoskeletal pain in different body locations. *Family Practice* 24 (4), pp.308–316.

Parsons, S. et al., 2007. The Influence of patients' and primary care practitioners' beliefs and expectations about chronic musculoskeletal pain on the process of care a systematic review of qualitative studies. *Clinical Journal of Pain*, 23(1) pp. 97-8.

Pastor, M.A. et al., 2012. Clinical self-efficacy and illness beliefs in ambiguous chronic pain conditions: General Practitioners' management of Fibromyalgia. *Anales De Psicologia*, 28(2), pp.417–425.

Pawson, R. et al., 2005. Realist review-a new method of systematic review designed for complex policy interventions. *Journal of Health Services Research & Policy*, 10 (Suppl 1), pp.21–34.

Peat, G., McCarney, R. & Croft, P., 2001. Knee pain and osteoarthritis in older adults: A review of community burden and current use of primary health care. *Annals of the Rheumatic Diseases*, 60(2), pp.91–7.

Petrucci, C.J. & Quinlan, K.M., 2007. Bridging the research-practice gap: Concept mapping as a mixed-methods strategy in practice-based research and evaluation. *Journal of Social Service Research*, 34(2), pp.25–42.

Pett, M.A., Lackey, N.R. & Sullivan, J.J., 2003. *Making Sense of Factor Analysis: The Use of Factor Analysis for Instrument Development in Health Care Research*, London: Sage.

Petty, N.J. ed., 2013. *Neuromusculoskeletal Examination and Assessment: A Handbook for Therapists* (4th Edition), Churchill Livingstone.

Phillips, C. et al., 2008. Prioritising pain in policy making: The need for a whole systems perspective. *Health Policy*, 88(2–3), pp.166–175.

Pincus, T. et al., 2007. Attitudes to back pain amongst musculoskeletal practitioners: A comparison of professional groups and practice settings using the ABS-mp. *Manual Therapy*, 12(2), pp.167–176.

Pincus, T., Vogel, S., Breen, A., et al., 2006. Persistent back pain - Why do physical therapy clinicians continue treatment? A mixed methods study of chiropractors, osteopaths and physiotherapists. *European Journal of Pain*, 10(1), pp.67–76.

Pincus, T., Vogel, S., Santos, R., et al., 2006. The Attitudes to Back Pain Scale in musculoskeletal practitioners (ABS-mp): The development and testing of a new questionnaire. *Clinical Journal of Pain*, 22(4), pp.378–387.

Pincus, T. et al., 2013. Twenty-five years with the biopsychosocial model of low back pain-is it time to celebrate? A report from the twelfth international forum for primary care research on low back pain. *Spine*, 38(24), pp.2118–23.

Pincus, T., Greenwood, L. & McHarg, E., 2011. Advising people with back pain to take time off work: A survey examining the role of private musculoskeletal practitioners in the UK. *Pain*, 152(12), pp.2813–2818.

Pincus, T. & McCracken, L.M., 2013. Psychological factors and treatment opportunities in low back pain. *Best Practice & Research. Clinical Rheumatology*, 27(5), pp.625–35.

Pit, S.W., Vo, T. & Pyakurel, S., 2014. The effectiveness of recruitment strategies on general practitioner's survey response rates - a systematic review. *BMC Medical Research Methodology*, 14(1), pp.1–14.

Podsakoff, P.M., Mackenzie, S.B. & Podsakoff, N.P., 2016. Recommendations for creating better concept definitions in the organizational, behavioral, and social sciences. *Organizational Research Methods*, 19(2), pp.1–45.

Poiraudeau, S. et al., 2006. Outcome of subacute low back pain: Influence of patients' and rheumatologists' characteristics. *Rheumatology*, 45(6), pp.718–723.

Popay, J. et al., 2006. *Guidance on the Conduct of Narrative Synthesis in Systematic Reviews* A Product from the ESRC Methods Programme. Lancaster University.

Preacher, K.J. & MacCallum, R.C., 2003. Repairing Tom Swift's electric factor analysis machine. *Understanding Statistics* 2(1) pp. 13-43

Presseau, J. et al., 2014. Reflective and automatic processes in health care professional behaviour: A dual process model tested across multiple behaviours. *Annals of Behavioural Medicine*. 2014 Dec; 48(3):347-58

Pribicevic, M., 2012. The epidemiology of shoulder pain: A narrative review of the literature. in "*Pain in Perspective*" InTech. pp147-186

Prince, M.J. et al., 2015. The burden of disease in older people and implications for health policy and practice. The Lancet, 385 (9967), pp.549-562.

Quintner, J.L., et al., 2008. Pain medicine and its models: Helping or hindering?. *Pain Medicine*, *9*(7), pp.824-834.

Rainville, J., Bagnall, D. & Phalen, L., 1995. Health care providers' attitudes and beliefs about functional impairments and chronic back pain. *Clinical Journal of Pain*, 11(4), pp.287–295.

Rankin, G. & Stokes, M., 1998. Reliability of assessment tools in rehabilitation: An illustration of appropriate statistical analyses. *Clinical rehabilitation*, 12(3), pp.187–99.

Rebbeck, T., Macedo, L.G. & Maher, C.G., 2013. Compliance with clinical guidelines for whiplash improved with a targeted implementation strategy: A prospective cohort study. *BMC Health Services Research*, 13(1), p.1.

Reid, N., 2006. Thoughts on attitude measurement. *Research in Science & Technological Education*, 24(1), pp.3–27.

Reise, S.P., Waller, N.G. & Comrey, A.L., 2000. Factor analysis and scale revision. *Psychological Assessment*, 12(3), pp.287–297.

Riley, J.F., Ahern, D.K. & Follick, M.J., 1988. Chronic pain and functional impairment: Assessing beliefs about their relationship. *Archives of Physical Medicine and*

Rehabilitation, 69(8), pp.579–582.

Rindfuss, R.R. et al., 2015. Do low survey response rates bias results? Evidence from Japan. *Demographic Research*, 32(1), pp.797–828.

Rolstad, S., Adler, J. & Rydén, A., 2011. Response burden and questionnaire length: Is shorter better? A review and meta-analysis. *Value in Health*, 14(8), pp.1101–1108.

Rosas, S.R., 2012. The utility of concept mapping for actualizing participatory research. *Cuadernos Hispanoamericanos De Psicologia*, *12*(2), pp.7-24.

Rosas, S.R. & Camphausen, L.C., 2007. The use of concept mapping for scale development and validation in evaluation. *Evaluation and Program Planning*, 30, pp.125–135.

Rosas, S.R. & Kane, M., 2012. Quality and rigor of the concept mapping methodology: A pooled study analysis. *Evaluation and Program Planning*, 35(2), pp.236–245.

Rosas, S.R. & Ridings, J.W., 2016. The use of concept mapping in measurement development and evaluation: Application and future directions. *Evaluation and Program Planning*, 60 pp. 265-276.

Rosenberg, S. & Kim, M.P., 1975. The method of sorting as a data gathering procedure in multivariate research. *Multivariate Behavioral Research*, 10, pp.489–502.

Roussel, N.A. et al., 2015. History taking by physiotherapists with low back pain patients: Are illness perceptions addressed properly? *Disability and Rehabilitation*, 38 (13) pp. 1268-79

Salathé, C.R. & Elfering, A., 2013. A health and resource-oriented perspective on NSLBP. *ISRN Pain*, Vol 2013.

Sandelowski, M. et al., 2012. Mapping the mixed methods – mixed research synthesis terrain. *Journal of Mixed Methods Research*, 6(4), pp.317–331.

Sanders, 2013. Implementing change in physiotherapy: Professions, contexts and interventions. *Journal of Health Organization and Management*, 28(1) pp. 96-114

Sanders, T., Foster, N.E. & Ong, B.N., 2011. Perceptions of general practitioners towards the use of a new system for treating back pain: A qualitative interview study. *BMC Medicine*, 9, p.49.

Schers, H., Wensing, M., Huijsmans, Z., van Tulder, M. and Grol, R., 2001. Implementation barriers for general practice guidelines on low back pain: A qualitative study. *Spine*, *26*(15), pp. E348-E353.

Schmitt, N., 1996. Uses and abuses of coefficient alpha. *Psychological Assessment*, 8(4), pp.350–353.

Schwarz, N., 2007. Attitude Construction: Evaluation in Context. *Social Cognition*, 25(5), pp.638–656.

Schwarz, N. & Bohner, G., 2007. The Construction of Attitudes. *Blackwell Handbook of*

Social Psychology: Intraindividual Processes, pp.436–457.

Shaw, W.S. et al., 2013. Effects of workplace, family and cultural influences on low back pain: What opportunities exist to address social factors in general consultations? *Best Practice & Research. Clinical Rheumatology*, 27(5), pp.637–48.

Sim, J. & Wright, C., 2000. *Research in Health Care*, Cheltenham: Nelson Thornes Ltd.

Simmonds, M.J., Derghazarian, T. & Vlaeyen, J.W.S., 2012. Physiotherapists' knowledge, attitudes, and intolerance of uncertainty influence decision making in low back pain. *The Clinical Journal of Pain*, 28(6), pp.467–74.

Simms, L.J., 2008. Classical and modern methods of psychological scale construction. *Social and Personality Psychology Compass*, 2(1), pp.414–433.

Simms, L.J. & Watson, D., 2007. The construct validation approach to personality scale construction. *Handbook of Research Methods in Personality Psychology*, pp.240–258.

Singla, M. et al., 2015. Physiotherapists assessment of patients' psychosocial status : Are we standing on thin ice? A qualitative descriptive study. *Manual Therapy*, 20(2), pp.328–334.

Sit, R.W.S. et al., 2015. Primary care physicians' attitudes and beliefs towards chronic low back pain: An Asian study. *Plos One*, 10(1), pp.e0117521–e0117521.

Slater, H. et al., 2012. A Policy-into-practice intervention to increase the uptake of evidence-based management of low back pain in primary care: A prospective cohort study. *Plos One*, 7(5), pp.e38037–e38037.

Slater, H. et al., 2010. A targeted general practitioner education program for the management of non-specific low back pain in primary care. *Anaesthesia and Intensive Care*, 38(3), pp.586–587.

Smith, R.C., 2002. The biopsychosocial revolution: Interviewing and provider-patient relationships becoming key issues for primary care. *Journal of General Internal Medicine*, 17(4), pp.309–310.

Soklaridis, S., Ammendolia, C. & Cassidy, D., 2010. Looking upstream to understand low back pain and return to work: Psychosocial factors as the product of system issues. *Social Science & Medicine*, 71(9), pp.1557–1567.

Song, F., Hooper, L. & Loke, Y.K., 2013. Publication bias: What is it? How do we measure it? How do we avoid it? *Open Access Journal of Clinical Trials*, 5, pp.71–81.

Sowden, G. et al., 2012. Targeted treatment in primary care for low back pain: The treatment system and clinical training programmes used in the IMPaCT Back study. *Family Practice*, 29(1), pp.50–62.

Speed, C., Hazleman, B. & Dalton, S., 2006. *Fast Facts: Soft Tissue Disorder*s. Health Press Ltd.

Stevens, J.P., 2002. *Applied Multivariate Statistics for the Social Sciences* (4th Edition).

Routledge.

Streiner, D.L., Norman, G.R. & Cairney, J., 2015. *Health Measurement Scales: A practical guide to their development and use* (5th Edition), Oxford University Press.

Stroebe, W., 2000. *Social psychology and health*. Open University Press

Sudman, S., 1985. Mail surveys of reluctant professionals. *Evaluation Review*, 9(3), pp.349–360.

Sullivan, M.J.L. et al., 2006. A psychosocial risk factor-targeted intervention for the prevention of chronic pain and disability following whiplash injury. *Physical Therapy*, 86(1), pp.8–18.

Sullivan, M.J.L. & Adams, H., 2010. Psychosocial treatment techniques to augment the impact of physiotherapy interventions for low back pain. *Physiotherapy Canada*, 62(3), pp.180–189.

Symonds, T.L. et al., 1996. Do attitudes and beliefs influence work loss due to low back trouble? *Occupational Medicine*, 46(1), pp.25–32.

Synnott, A. et al., 2015. Physiotherapists may stigmatise or feel unprepared to treat people with low back pain and psychosocial factors that influence recovery: A systematic review. *Journal of Physiotherapy*, 61(2), pp.68–76.

Synnott, A. et al., 2016. Physiotherapists report improved understanding of and attitude toward the cognitive, psychological and social dimensions of chronic low back pain after Cognitive Functional Therapy training: A qualitative study. *Journal of Physiotherapy*, 62(4), pp.215–221.

Tabachnick, B.G. & Fidell, L.S., 2007. *Using Multivariate Statistics* (5th Edition), Boston: Pearson Education.

Takasaki, H., Saiki, T. & Iwasada, Y., 2014. McKenzie therapists adhere more to evidence-based guidelines and have a more biopsychosocial perspective on the management of patients with low back pain than general physical therapists in Japan. *Open Journal of Therapy and Rehabilitation* 2 (4), pp.173–181.

Tan, B.K. et al., 2015. Low back pain beliefs and their relationships with low back pain related disability in nurses working in mainland China and in Australia. *Journal of Cultural Diversity*, 22(3), pp.71–81.

Tan, B.K. et al., 2014. Low back pain beliefs are associated to age, location of work, education and pain-related disability in Chinese healthcare professionals working in China: A cross sectional survey. *BMC Musculoskeletal Disorders*, 15, p.255.

Taylor, J.B. et al., 2014. Incidence and risk factors for first-time incident low back pain: A systematic review and meta-analysis. *Spine Journal*, 14(10), pp.2299–2319.

Teasell, R.W., 1999. Socioeconomic factors and work disability: Clues to managing chronic pain disorders. *Pain Research and Management*, 4(2), pp.89–92.

Ten Berge, J.M.F. 1972. Difficulty factors, distribution effects and the least squares simplex data metrix solution. *Educational and Psychological Measurement,* 32, pp.911-920

Terwee, C.B. et al., 2007. Quality criteria were proposed for measurement properties of health status questionnaires. *Journal of Clinical Epidemiology*, 60(1), pp.34–42.

Testa, M. & Rossettini, G., 2016. Enhance placebo, avoid nocebo: How contextual factors affect physiotherapy outcomes. *Manual Therapy*, 24, pp.65–74.

Tricco, A.C., Tetzlaff, J. & Moher, D., 2011. The art and science of knowledge synthesis. *Journal of Clinical Epidemiology*, 64(1), pp.11–20.

Trochim, W. & Kane, M., 2005. Concept mapping: An introduction to structured conceptualization in health care. *International Journal of Quality Health Care*, 17(3), pp.187–191.

Trochim, W.M., 2016. Hindsight is 20/20: Reflections on the evolution of concept mapping. *Evaluation and Program Planning*, 60, pp.176-185

Trochim, W.M. & McLinden, D., 2016. Introduction to a special issue on concept mapping. *Evaluation and Program Planning*, 60, pp.166-175.

Trochim, W.M.K., 1989. An introduction to concept mapping for planning and evaluation. *Evaluation and Program Planning*, 12, pp. 1-16.

Trochim, W.M.K., 1989. Concept mapping. Soft science or hard art? *Evaluation and Program Planning*, 12(1), pp.87–110.

Trochim, W.M.K. et al., 2004. Setting objectives for community and systems change: An application of concept mapping for planning a statewide health improvement initiative. *Health Promotion Practice*, 5(1), pp.8–19; discussion 10.

Trochim, W.M.K., 1993. The reliability of concept mapping. *Annual Meeting of the American Evaluation Association*, (1986), pp.1–12.

Tubbing, L., Harting, J. & Stronks, K., 2015. Unravelling the concept of integrated public health policy: Concept mapping with Dutch experts from science, policy, and practice. *Health Policy*, 119(6), pp.749–759.

Turner-Cobb, J.M., Michalaki, M. & Osborn, M., 2015. Self-conscious emotions in patients suffering from chronic musculoskeletal pain: A brief report. *Psychology & Health*, 30(4), pp.495–501.

Tymecka-Woszczerowicz, A., et al., 2015. Indirect costs of back pain–Review. *Polish Annals of Medicine*, *22*(2), 143-148.

UK Digital Health Report 2015 Last night the internet saved my life. Available at: https://cdn2.hubspot.net/hubfs/2037863/Push-Doctor-Images-April2016/Pdf/PushDoctor-Health-report.pdf?t=1498755520929.

Valjakka, A.L. et al., 2013. The association between physicians' attitudes to psychosocial aspects of low back pain and reported clinical behaviour: A complex issue.

Scandinavian Journal of Pain, 4(1), pp.25–30.

Vargas-Prada, S. & Coggon, D., 2015. Psychological and psychosocial determinants of musculoskeletal pain and associated disability. *Best Practice and Research: Clinical Rheumatology*, 29(3), pp.374–390.

De Vaus, D., 2002. *Surveys in Social Research*, Routledge.

Vaughn, L.M. et al., 2009. Cultural Health Attributions, Beliefs, and Practices: Effects on Healthcare and Medical Education. *The Open Medical Education Journal*, 2, pp.64-74.

Velozo, C.A. et al., 2012. Improving measurement methods in rehabilitation: Core concepts and recommendations for scale development. *Arch Phys Med Rehabil*, 93(8), pp.S154–S163.

de Vet, H.C. et al., 2011. *Measurement in Medicine*, Cambridge: Cambridge University Press.

de Vet, H.C.W. et al., 2006. When to use agreement versus reliability measures. *Journal of Clinical Epidemiology*, 59(10), pp.1033–1039.

de Vet, H.C.W. De et al., 2005. Are factor analytical techniques used appropriately in the validation of health status questionnaires? A systematic review on the quality of factor analysis of the SF-36. *Quality of Life Research*, 14(5), pp.1203–1218.

Vink, J.M. & Boomsma, D.I., 2008. A comparison of early and late respondents in a twin-family survey study. *Twin Research and Human Genetics*, 11(2), pp.165–173.

Visser, P.S., Krosnick, J.A. & Lavrakas, P.J., 2000. Survey research. In *Handbook of Research Methods in Social and Personality Psychology*. pp. 537–67.

Vogel, T. & Wanke, M. 2016. *Attitudes and Attitude Change*. (2nd Edition). Routledge.

Vonk, F. et al., 2009. Physiotherapists' treatment approach towards neck pain and the influence of a behavioural graded activity training: An exploratory study. *Manual Therapy*, 14(2), pp.131–138.

Vowles, K.E. & Thompson, M., 2012. The patient-provider relationship in chronic pain. *Current Pain and Headache Reports*, 16, pp.133–138.

de Vries, G. et al., 2014. Perceived impeding factors for return-to-work after long-term sickness absence due to major depressive disorder: A concept mapping approach. *PloS One*, 9(1), p.e85038.

Waddell, G. et al., 1993. A Fear-Avoidance Beliefs Questionnaire (FABQ) and the role of fear-avoidance beliefs in chronic low back pain and disability. *Pain*, 52(2), pp.157–68.

Waddell, G., 1987. A new clinical model for the treatment of low-back pain. *Spine*. pp632-644

Waddell, G., 1982. An approach to backache. *British Journal of Hospital Medicine*, 28(3), p.187, 190–1, 193–4.

Waddell, G., 2006. Preventing incapacity in people with musculoskeletal disorders. *British Medical Bulletin*; 77 and 78:, pp.55–69.

Waddell, G., 2004. *The Back Pain Revolution*, Edinburgh: Churchill Livingstone.

Wade, D.T. & Halligan, P.W., 2004. Do biomedical models of illness make for good healthcare systems? *British Medical Journal*, 329(7479), pp.1398–1401.

Waddell, G. & Main, C.J., 1984. Assessment of severity in low-back disorders. *Spine*, 9(2), pp.204–208.

Wakefield, J. et al., 2015. The pain of low status: The relationship between subjective socio-economic status and analgesic prescriptions in a Scottish community sample. *Psychology, Health & Medicine*. 21(1) pp 27-37

Wallace, L.S. et al., 2013. Development and validation of the Patient Opioid Education Measure. *Journal of Pain Research*, 6, pp.663–81.

Walsh, N.E. et al., 2008. Standards of care for acute and chronic musculoskeletal pain: The Bone and Joint Decade (2000-2010). *Archives of Physical Medicine and Rehabilitation*, 89(9), pp. 1830-45.

Watson, P.J. et al., 2008. General practitioner sickness absence certification for low back pain is not directly associated with beliefs about back pain. *European Journal of Pain*, 12(3), pp.314–321.

Weiner, B.K., 2008. The biopsychosocial model and spine care. *Spine*, 33(2), pp.219–223.

Weir, J.P., 2005. Quantifying test-retest reliability using the intraclass correlation coefficient and the SEM. *Journal of Strength and Conditioning Research*, 19(1), pp.231–240.

Werner, E.L. et al., 2005. Beliefs about low back pain in the Norwegian general population: Are they related to pain experiences and health professionals? *Spine*, 30(15), pp.1770–1777.

Werner, E.L. et al., 2008. Healthcare provider back pain beliefs unaffected by a media campaign. *Scandinavian Journal of Primary Health Care*, 26(1), pp.50–57.

Wertli, M.M. et al., 2014. Fear-avoidance beliefs - a moderator of treatment efficacy in patients with low back pain: A systematic review. *The Spine Journal*, 14(11), pp.2658–2678.

Williams, A.C.C., Eccleston, C. & Morley, S., 2012. Psychological therapies for the management of chronic pain (excluding headache) in adults. *The Cochrane Database of Systematic Reviews*, 11, p.CD007407.

Wilson, T., Lindsey, S. & Schooler, T.Y., 2000. A model of dual attitudes. *Psychological Review,* 107 (1), pp.101-26.

van der Windt, D. a & Dunn, K.M., 2013. Low back pain research-future directions. *Best Practice & Research. Clinical Rheumatology*, 27(5), pp.699–708.

van der Windt, D. et al., 2008. Psychosocial interventions for low back pain in primary care: Lessons learned from recent trials. *Spine*, 33(1), pp.81–9.

Vlaeyen, J.W. and Linton, S.J., 2006. Are we "fear- avoidant"? *Pain*, 124(3), pp.240-241.

de Winter, J.C.F. & Dodou, D., 2012. Factor recovery by principal axis factoring and maximum likelihood factor analysis as a function of factor pattern and sample size. *Journal of Applied Statistics*, 39(4), pp.695–710.

Wolfe, F. et al., 2010. The American College of Rheumatology preliminary diagnostic criteria for fibromyalgia and measurement of symptom severity. *Arthritis Care & Research*, 62, pp.600–610.

Wooten, D.B. & Reed, A., 2000. A conceptual overview of the self-presentational concerns and response tendencies of focus group participants. *Journal of Consumer Psychology*, 9(3), pp.141–153.

World Health Organization, 2002. Towards a common language for functioning, disability and health ICF. *International Classification*, 1149, pp.1–22.

Wynne-Jones, G. et al., 2014. Perceptions of health professionals towards the management of back pain in the context of work: A qualitative study. *BMC Musculoskeletal Disorders*, 15(1), pp.1–10.

Zou, K. et al., 2016. Examination of overall treatment effect and the proportion attributable to contextual effect in osteoarthritis: Meta-analysis of randomised controlled trials. *Annals of the Rheumatic Diseases*, 75 (11), pp. 1964-1970.

Zusman, M., 2011. The modernisation of manipulative therapy. *International Journal of Clinical Medicine*, 2(5), p.644-649.

Zusman, M., 2013. Hands on, hands off? The swings in musculoskeletal physiotherapy practice. *Manual Therapy*, 18(3), p.e13.

Appendices

Chapter 1

1 Existing Pain Attitudes and Beliefs Scale

Chapter 3

2 Scoping review search strategy for MEDLINE

3 Data extraction form

4 Characteristics of studies included in the scoping review

5 Unique items representing the nine most prevalent constructs

Chapter 4

6 Ethical approval letters

7 Workshop materials – information sheets and consent forms.

8 MAPS

9 Final cluster lists a) international group b) local group

10 Complete framework

Chapters 5 and 6

11 Study questionnaire

12 Other study documents

Chapter 7

13 EFA correlation matrix

14 Item table

15 Two and three factor solution tables

16 CFA Modification indices a) Biopsychosocial b) Biomedical

Appendix 1 - Existing Pain Attitudes and Beliefs Scale

Houben et al. (2005)

Biomedical subscale

(3) Pain is a nociceptive stimulus, indicating tissue damage

(6) Patients with back pain should preferably practice only pain free movements

(8) Back pain indicates the presence of organic injury

(9) If back pain increases in severity, I immediately adjust the intensity of my treatment accordingly

(10) If treatment/therapy does not result in a reduction in back pain, there is a high risk of severe restrictions in the long term

(11) Pain reduction is a precondition for the restoration of normal functioning

(12) Increased pain indicates new tissue damage or the spread of existing damage

(15) If patients complain of pain during exercise, I worry that damage is being caused

(16) The severity of tissue damage determines the level of pain

(19) In the long run, patients with back pain have a higher risk of developing spinal impairments

Biopsychosocial subscale

(1) Mental stress can cause back pain even in the absence of tissue damage

(2) The cause of back pain is unknown

(4) A patient suffering from severe pain will benefit from exercise

(5) Functional limitations associated with back pain are the result of psychosocial factors

(7) Treatment/therapy may have been successful even if pain remains

(13) There is no effective treatment to eliminate back pain

(14) Even if the pain has worsened, the intensity of the next treatment can be increased

(17) Learning to cope with stress promotes recovery from back pain

(18) Exercises that may be back straining should not be avoided

Appendix 2 - Scoping review search strategy for MEDLINE

Conducted in Medline, 09.12.11

Lines 1 - 16 = terms used to identify studies related to healthcare practitioners
Lines 17 – 31 = terms used to identify studies related to attitudes, beliefs and related concepts
Lines 31 – 42 = terms used to identify studies related to common MSK pain
Lines 44-48 = database specific MeSH terms (amended for each database)

1	((health* or medical) adj2 (professional* or provider* or personnel)).ti,ab.	78348	Advanced
2	doctor*.ti,ab.	74258	Advanced
3	GP*.ti,ab.	94596	Advanced
4	medic.ti,ab.	477	Advanced
5	medics.ti,ab.	499	Advanced
6	"medical profession*".ti,ab.	8037	Advanced
7	physician*.ti,ab.	231258	Advanced
8	consultant*.ti,ab.	13500	Advanced
9	rheumatologist*.ti,ab.	3379	Advanced
10	nurse*.ti,ab.	167129	Advanced
11	physiotherapist*.ti,ab.	3019	Advanced
12	chiropractor*.ti,ab.	918	Advanced
13	osteopath*.ti,ab.	3451	Advanced
14	therapist*.ti,ab.	20264	Advanced
15	practitioner*.ti,ab.	80612	Advanced
16	clinician*.ti,ab.	96002	Advanced
17	attitude*.ti,ab.	78852	Advanced
18	belief*.ti,ab.	39958	Advanced
19	((treatment or practice or therapeutic) adj3 (approach* or orientation* or style)).ti,ab.	62387	Advanced
20	judgment*.ti,ab.	24036	Advanced
21	perception*.ti,ab.	113900	Advanced
22	philosophy.ti,ab.	10495	Advanced

23	prejudice*.ti,ab.	3177	Advanced
24	opinion*.ti,ab.	48619	Advanced
25	stance.ti,ab.	7096	Advanced
26	view.ti,ab.	172688	Advanced
27	views.ti,ab.	40520	Advanced
28	viewpoint.ti,ab.	19281	Advanced
29	(fear adj3 avoidan*).ti,ab.	797	Advanced
30	"pain related fear".ti,ab.	139	Advanced
31	(pain adj3 catastrophis*).ti,ab.	29	Advanced
32	"musculoskeletal pain".ti,ab.	2128	Advanced
33	"non-malignant pain".ti,ab.	212	Advanced
34	("non-specific" adj3 pain).ti,ab.	703	Advanced
35	(chronic adj3 "widespread pain").ti,ab.	298	Advanced
36	("multi site" adj3 pain).ti,ab.	9	Advanced
37	fibromyalgia.ti,ab.	5075	Advanced
38	((back or lumbar or thoracic or neck or cervical or shoulder or glenohumeral or scapul* or arm or hand or hip or knee or ankle or foot or joint or musc*) adj pain).ti,ab.	43273	Advanced
39	NSLBP.ti,ab.	31	Advanced
40	whiplash.ti,ab.	2143	Advanced
41	arthriti*.ti,ab.	110434	Advanced
42	osteoarthriti*.ti,ab.	28827	Advanced
43	biopsychosocial.mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]	2495	Advanced
44	exp medical staff/ or exp nurses/ or exp medical staff, hospital/ or exp nursing staff, hospital/ or exp physicians/	186740	Advanced
45	exp Pain/	275951	Advanced
46	exp Musculoskeletal Diseases/	762169	Advanced
47	45 and 46	41086	Advanced
48	exp "attitude of health personnel"/ or exp health knowledge, attitudes, practice/ or exp catastrophization/	156715	Advanced

49	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 44	837514	Advanced
50	17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 48	668156	Advanced
51	32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 47	202241	Advanced
52	49 and 50 and 51	2215	Advanced

Appendix 3 - Data extraction form

Author(s):

Title:

Publication/citation:

Data extraction and analysis performed by:
Date:

What **attitudinal/belief items** are included (**as identified by the authors)**	Identified "themes" or **constructs** – 'Bs' (and 'As' if appropriate) **NB: Please indicate if these are as stated by the authors – or self-determined.**

Key constructs identified/notes

Appendix 4 - Characteristics of studies included in the scoping review

Ist AUTHOR AND DATE	STUDY DETAILS (Design, participant HCPs, setting, country, MSK condition)	FORMAL MEASURE(S)	ITEM ORIGIN/DEVELOPMENT	STATED TARGET ATTITUDINAL CONSTRUCT	PRIMARY ATTITUDINAL CONSTRUCTS IDENTIFIED
Battie et al 1994	Cross sectional survey; PTs; Various practice settings; USA; LBP	None = survey instrument developed for study	Survey instrument similar to one used in Cherkin et al 1988 - questions about provider characteristics, attitudes about low back pain, beliefs about the causes of back symptoms, evaluation and treatment preferences and confidence in treating patients with back pain.	Physical therapists beliefs concerning patients with LBP	Attribution/causality Treatment Determinants of outcome Expectations Clinician confidence and comfort (with managing NSMSK pain)
Bishop et al 2008	Cross sectional survey GPs in primary care PTs in primary or secondary care UK NS-LBP	PABS-PT (19-item version)	Amended (19 item) PABS-PT (Houben et al 2005) - selected following review of available tools for assessing the attitudes/beliefs of HCPs about LBP. Development with PTs, but use in studies of GPs discussed.	Potential role that HCP's attitudes/beliefs might play in the healthcare process. Acknowledge RANGE of attitudes/beliefs that HCPs hold about back pain (including associations) with work and activity recommendations. Aimed to measure	Pain ↔ harm/damage Prognosis/natural history of condition Attribution/causality Treatment Focus/aim of treatment Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest (therapeutic use of/as treatment)

				attitudes/beliefs (and reported clinical behaviour) about LBP. Uses the PABS which assesses the strength of TREATMENT ORIENTATION on two subscales - biomedical and Biopsychosocial.	Determinants of outcome Expectations Clinician confidence and comfort (with managing NSMSK pain) Clinicians' perceptions of what patients think Work Perceived value and use of condition specific guidelines and clinical tools
Bowey-Morris et al 2010	Cross sectional survey GPs Primary care Jersey, UK LBP	PABS-GP (17 items)	An ADAPTED version of the PABS - GP-specific population => 12 item biomedical subscale and a 5 item Biopsychosocial subscale - CITE WATSON ET AL 2008 AS ORIGIN OF THIS ADAPTATION. (Also refer to use of tool in GPs by Jellema et al 2005	To measure test-retest reliability of the Pain Attitudes and Beliefs Scale	Pain ↔ harm/damage Attribution/causality Treatment Focus/aim of treatment Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest (therapeutic use of/as treatment) Determinants of outcome
Buchbinder et al 2001	Quasi-experimental GPs Primary care Australia	Survey instrument developed for study but little detail provided	Questionnaire modified from that developed by Bombardier et al 1995. Survey includes a set of questions to determine what the doctors knew	Knowledge about doctors' management of acute low back pain	Determinants of outcome Expectations

	Acute LBP	about the instrument	about the management of acute low back pain and attitudes towards the patients (5 point Likert scale).	and their attitudes towards the patients.	Clinician confidence and comfort (with managing NSMSK pain)
Buchbinder and Jolley 2007	Quasi-experimental GPs Primary care Australia Acute LBP	Survey instrument developed for study but uses items taken from earlier studies.	As for 2001 study above - including a set of questions aimed at eliciting knowledge about the management of acute low back pain and attitudes toward these patients.	To measure GPs' beliefs and stated behaviour about back pain	Attribution/causality Determinants of outcome Expectations Clinician confidence and comfort (with managing NSMSK pain) Perceived value and use of condition specifc guidelines and clinical tools
Buchbinder et al 2009	survey GPs Primary care Australia Acute LBP	Survey instrument developed for study but uses items taken from earlier studies.	As for 2001 study above - including a set of questions aimed at eliciting knowledge about the management of acute low back pain and attitudes toward these patients.	GPs' beliefs about LBP.	Attribution/causality Determinants of outcome Expectations Clinician confidence and comfort (with managing NSMSK pain) Perceived value and use of condition specific guidelines and clinical tools
Bush et al 1993	Secondary analysis of data obtained during a longitudinal experimental cohort study; Physicians Primary care; USA;	None	11 questions designed to measure physician confidence with the management of LBP and their attitudes toward patients with LBP. A five-point Likert (agreement) scale was used. PCA used to confirm two-factor solution labelled 'confidence'	Physicians' confidence in their abilities to effectively manage low back pain, and	Expectations Clinician confidence and comfort (with managing NSMSK pain)

	LBP		and 'attitude' - no description of origin/generation of the items. Subscale scores for each provider were calculated by adding the numerical values of each response and dividing by the number of items in the subscale. The two subscales were dichotomized at the median to define "high" and "low" confidence groups and "more positive" and "less positive" attitude groups	their attitudes about patients with back pain.	
Chaudhary et al 2004	Cross-sectional survey; GPs; Primary care; UK; ("Mechanical") LBP	None	10 item questionnaire based on RCGP clinical guidelines and the Back Book. Dichotomous responses (true/false). However, results to these questions from the Victoria mass media studies are presented - although they do not describe using the same tool.	To evaluate GPs awareness of current guidelines and use of The Back Book.	Ability to/necessity for (precise) diagnosis Prescribed exercise and rest (therapeutic use of/as treatment) Determinants of outcome Expectations Clinician confidence and comfort (with managing NSMSK pain) Work Perceived value and use of condition specific guidelines and clinical tools
Chen et al 2005	Cross sectional survey; Occupational physicians and rheumatologists; Occupational and secondary care settings; UK; "MSK disorders"	None	Questionnaire developed from appraisal of literature on the work-relatedness of MSK disorders and elements in the clinical decision-making process. Three sections: (section II focus of this study): I = clinical characteristics of physicians	Indications that condition may be work-related	Attribution/causality

			II = issues that prompt physicians to consider an MSK condition to be work-related and the defining criteria for work-relatedness III = understanding/views about the surveillance system. Questionnaire tested in pilot study (members of advisory committees for the surveillance system and research staff) - and amended based on feedback. ?two potential areas that might be considered to be 'belief/attitudinal' - 1) what prompts physicians to consider whether a condition is work-related and 2) the six proposed criteria of work-relatedness		
Chen et al 2011	Observational cross-sectional survey	BBQ-HC HC-PAIRS FABQ-HC	Translation and cultural adaptation of 3 standard measures of attitudes and beliefs	To perform a psychometric evaluation of simplified Chinese versions of back pain beliefs questionnaires for use in health care professionals living in mainland China.	Prognosis/natural history of condition Impact Treatment Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest (therapeutic use of/as treatment) Expectations Work
Cherkin et al 1988	Cross sectional survey Family physicians and chiropractors Primary Care USA Back pain	None	Two-stage process: discussion groups with family physicians and chiropractors → identification of range of provider beliefs, attitudes, and behaviours associated with managing back pain. Questionnaires to determine the prevalence of the specific beliefs and behaviours identified were then constructed and pilot-tested. Items concerning	The diagnosis and prognosis of back pain, Therapy and prevention, Comfort managing back pain and Perceived patient satisfaction	Prognosis/natural history of condition Attribution/causality Ability to/necessity for (precise) diagnosis Treatment

			provider characteristics (age, sex, years in practice, adequacy of training to manage back pain, and personal experience with back pain); provider beliefs and attitudes about managing back pain, and attitudes about patients with back pain were included.		Role of clinician or (desirable) clinical actions/behaviours Clinician confidence and comfort (with managing NSMSK pain)
Cherkin et al 1991	Before/after intervention study; Physicians; Primary Care; USA; LBP	None	Details of the tool and its development not included.	To evaluate clinical and attitudinal beliefs of physicians towards patients with back pain	Prognosis/natural history of condition Attribution/causality Role of clinician or (desirable) clinical actions/behaviours Expectations Clinician confidence and comfort (with managing NSMSK pain)
Coudeyre et al 2006	Cross sectional survey GPs Primary Care France LBP (acute and chronic items in part 4 of questionnaire)	FABQ-HC	As Poiraudeau et al 2006 (with Rheumatologists).	Fear-avoidance beliefs	Pain ↔ 'normal' (physical) activity/function Expectations Work
Coudeyre et al 2007b	GPs Same cohort/study as 2006 paper. Primary care France Acute low back pain (BUT - part 4 of questionnaire still included items about	FABQ-HC	As above - same authors as 2006 paper.	Fear-avoidance beliefs	Pain ↔ 'normal' (physical) activity/function Expectations Work

	management of both acute and chronic LBP).				
Curtis et al 1997	Physicians Primary care Acute LBP	None	Items based on previous measures of physician CONFIDENCE developed by Bush et al. and refined by Smucker et al - BUT table that presents these items labelled as ATTITUDES. Presented as proportion of participants who responded in a specified direction – agree/disagree, and response set not described.	attitudes to caring for low back pain	Attribution/causality Role of clinician or (desirable) clinical actions/behaviours Expectations Clinician confidence and comfort (with managing NSMSK pain)
Derghazarian and Simmonds 2011	PTs; Outpatient adult rheumatology and orthopaedic settings; Public and private; Canada; LBP	PABS-PT (19-item version) ABS-mp	Standardised versions of the PABS-PT (Houben et al 2005) and ABS-mp (Pincus et al 2006)	attitudes toward and beliefs about LBP and knowledge of CPGs; relationships between PTs' attitudes toward and beliefs about LBP and their judgments and treatment recommendations	Pain ↔ harm/damage Prognosis/natural history of condition Attribution/causality Treatment Focus/aim of treatment Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest (therapeutic use of/as treatment) Determinants of outcome
DeVellis et al 1986	Validation study; OTs and PTs; (not stated) USA 'Arthritis'	None – Attitude Toward Arthritis Patients Scale	Eight of the initial 12 item pool were drawn from Wickersham et al (1982) - a study which primarily investigated therapists' preferred learning methods, but which included items assessing	Determinants and consequences of attitudes towards workings with arthritis patients.	Clinician confidence and comfort (with managing NSMSK pain)

			therapist's attitudes (and knowledge) toward arthritis patients. Two changes were made: 1) increased response options (to achieve greater variability), 2) four items changed from negative to positive (to determine if there was response bias favouring (dis)agreement - irrespective of content). Four additional items were written "to reflect aspects of therapists' attitudes possibly not represented among the original eight items". There is no information provided about the origin/development of these items.		
Evans et al 2010	RCT; Chiropractors, Osteopaths and PTs; UK; Acute LBP	HC-PAIRS (13-item version)	MODIFIED - 13 item HC-PAIRS (developed by Rainville et al 1995) - details of modification in 2005 protocol paper.	Effect of MSK practitioners' beliefs and behaviours on management of LBP	Impact Pain ↔ 'normal' (physical) activity/function Expectations
Fullen et al 2011	GPs Primary care Republic of Ireland. Chronic LBP	PABS-GP (17 items)	Modified version of PABS for GPs (as used by Watson et al 2007)	attitudes and beliefs of GPs regarding chronic LBP, the factors that influence these, and their impact on the management of patients with chronic LBP.	Pain ↔ harm/damage Attribution/causality Treatment Focus/aim of treatment Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest (therapeutic use of/as treatment) Determinants of outcome

Guzman et al 2002	GPs, family and emergency physicians (regularly caring for injured workers). Family (primary care) practices and emergency departments Canada 'Soft-tissue injuries'	None	Two-page questionnaire developed through meetings with primary care and occupational physicians and with labour, management and WCB representatives; and pretested with eight family physicians. The questionnaire contained: possible facilitating factors and possible barriers to treating patients with STIs - which participants had to rank for importance and exploration of physician's knowledge and attitudes in two ways: 1) vignette (acute LBP) and list of initial management strategies 2) set of statements (agree/disagree) about work-related disability after STI. Response option to these two sections derived from "medical association statements", from the scientific literature and from report of interviews with workers, employers and insurers. Items presented in a random order and several reversed to decrease risk of response bias.	Interventions believed to help recovery and reduce work disability AND beliefs about work-related disability	Prognosis/natural history of condition Treatment Work
Haldorsen et al 1996	Cross-sectional observation study; HCPs; working for National Insurance Administration; Norway; MSK conditions	None	12 case histories each supported with a 13-item questionnaire; no information provided about the development of the questionnaire.	Examines consensus of HCPs about sickness certification, medical referral, and diagnosing	Very tricky - and quite different to all other papers, therefore doesn't really fit in any of themes…essentially, asking if someone with MSK pain is 'ill', whether MSK pain is a 'disease' and whether sick certification required.

Henrotin et al 2011	GPs and Rheumatologists France Acute LBP	FABQ-HC	FABQ - In the current study, the wording of the items was modified to ask the physicians to rate the FABQ items with respect to beliefs that patients have expressed about their low back pain. The consistency score results from a consensus of experts (members of the COST B13 group) testifying of its content validity. The internal consistency of the questionnaire has also been tested (see statistical section). Agreement scale (0-6, with 3 reversed items). [One item (12) "Spinal manipulation provided by professionals may worsen back pain" withdrawn as judged ambiguous.	Fear-avoidance beliefs	Pain ↔ 'normal' (physical) activity/function Expectations Work
Houben et al 2004	"Paramedical therapists". Therapists from several 'paramedical' disciplines - physio- and manual therapy, chiropractic and McKenzie Netherlands CLBP	HC-PAIRS (?15-item version)	15 item HC-PAIRS (developed by Rainville et al 1995) - assessing HCP's attitudes and beliefs about functional expectations for CLBP patients. TRANSLATED INTO DUTCH (by the authors) for this study (forward and back translation described).	Functional expectations	Impact Pain ↔ 'normal' (physical) activity/function Expectations
Houben et al 2005b	"Paramedical therapists". Netherlands 'Common' LBP	PABS-PT HC-PAIRS (13-item version), BBQ, TSK-HC	PABS-PT: 31 items from Ostelo et al 2003 PLUS five new items designed to enhance the second (behavioural/biopsychosocial factor) created by same authors as original development paper but no validity check beyond face validity; HC-PAIRS (developed by Rainville et al 1995) - only added to measurements halfway through study (no explanation provided). Only used the 13 items retained by Houben et al 2005 (no item 10 and 13); BBQ (aimed at measuring beliefs about the inevitability of negative consequences of LBP - Symonds et al 1996) = 9 statements, 6 point Likert scale - WORDING ADAPTED FOR USE WITH (PHYSIO)THERAPISTS. The BBQ-HC was only used	PABS = Rx orientation Functional expectations Beliefs about harmfulness of physical activity for (LBP) patients BBQ - 'inevitability' scale identified in original scale development paper	Pain ↔ harm/damage Prognosis/natural history of condition Impact Attribution/causality Ability to/necessity for (precise) diagnosis Treatment Focus/aim of treatment

			until half-way through study, when HC-PAIRS added..?why. TSK (a measure of fear of movement or (re-)injury in patients originally developed by Kori et al 1990), again wording adapted for use with HCPs - contains 17 items, Likert scale		Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest (therapeutic use of/as treatment) Determinants of outcome Expectations Clinicians' perceptions of what patients think Work
Jellema et al 2005	GPs Primary care (Sub)acute LBP	PABS - 20-item (Ostelo) version	PABS - slightly modified (?20 items - OSTELO VERSION) and two additional items: 'I think this newly learned treatment strategy is a valuable strategy to apply to patients with LBP' and 'By participating in the two training sessions I have received sufficient skills to apply the newly learned treatment strategy' - 4-point Likert scale (agreement) - NB: these concern the MIS training, rather than LBP per se.	PABS = Rx orientation	Pain ↔ harm/damage Prognosis/natural history of condition Attribution/causality Ability to/necessity for (precise) diagnosis Treatment Focus/aim of treatment Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest (therapeutic use of/as treatment) Determinants of outcome

Kent and Keating 2004	Cross-sectional observational study; HCPs; Primary care; Australia; NSLBP	No	Questionnaires developed during a pilot study involving interviews of 2 HCP from each professional group. Very little information provided about development.	Beliefs about NSLBP and subgrouping, and whether this belief influences their management of NSLBP.	Attribution/causality Ability to/necessity for (precise) diagnosis Treatment
Kent et al 2009a	Cross-sectional, observational study; HCPs; 2006 Amsterdam International Low Back Pain Forum and a low back pain meeting in Melbourne; NSLBP	No	Questionnaire development included a pilot study involving interviews of six NSLBP clinicians and researchers and led to a 13 item instrument collecting data on demographics, beliefs about back pain clusters, usefulness of measures, and whether LBP is primarily physiological or psychological	Development of a conceptual framework of NSLBP based on the views HCPs; and examining clustering of beliefs within that framework;	Attribution/causality ?Perceived value and use of condition specific guidelines and clinical tools
Li and Bombardier 2001	Cross-sectional observational study; PTs; Canada (Acute/subacute) LBP	No	Questionnaire was modelled on one used in a study of Primary Care Physicians by Janz et al (?1998 and the one sent to AB by Charmaine Heath/Claire Bombardier) - modified slightly to include choices of assessment and treatment techniques that were pertinent to physical therapy practice. Pretest for face and content validity conducted with 9 physical therapists who were practicing in orthopedics and 1 therapist who had a research interest in survey development.(NB: most of these items also appear in the Buchbinder work).	Beliefs regarding treatment of acute and sub-acute LBP	Treatment Prescribed exercise and rest (therapeutic use of/as treatment) Determinants of outcome Clinician confidence and comfort (with managing NSMSK pain) ?Perceived value and use of condition specific guidelines and clinical tools

Linton et al 2002	Cross-sectional, observational study; GPs and PTs; Primary care; Sweden; LBP	No	Items selected that reflect attitudes about the relationship between activity, pain and injury for NSBP. 5 items from TSK, 5 from FABQ and the PAIRS - reworded so would be relevant to HCPs. 4 items were developed to assess SR practice behaviour (including 1 item to assess SR ability to predict long-term problems)	Beliefs of physicians and PTs about LBP	Pain ↔ harm/damage Attribution/causality Focus/aim of treatment, ?Role of clinician or (desirable) clinical actions/behaviours Prescribed exercise and rest (therapeutic use of/as treatment) Clinician confidence and comfort (with managing NSMSK pain) Work
Lorig et al 1984	Cross-sectional, observational study; Physicians - mainly rheumatologists; USA; arthritis	No	Development was in two stages; 1) 3 prelimary questions to patients asking them about their experience of arthritis. 2) Physicians were then asked 5 questions about their understanding of patients' perspectives of their arthritis.	Beliefs about arthritis and its treatment	Clinicians' perceptions of what patients think
Morris and Watson 2011	Cross-sectional, observational study; GPs Primary care; UK (Jersey); LBP	PABS-GP (17 items); BBQ FABQ	PABS - GP (Watson et al 2008, Bowey-Morris et al 2010) adapted from Ostelo (2003) and Houben (2005)	Factors which determine sickness certification for LBP	Pain ↔ harm/damage Attribution/causality Treatment Focus/aim of treatment Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest

					(therapeutic use of/as treatment) Determinants of outcome
Ostelo et al 2003	PABS-PT development study; PTs; 86% in "private clinics"; Netherlands; Chronic LBP	PABS -PT 31item (development)	Reviewed existing questionnaires concerning patients' attitudes and beliefs towards chronic pain and rephrased items to a therapist's point of view Questions were taken from TSK; PCS; BBQ; FABQ. ALSO - items were added that authors "considered relevant in the management of CLBP". Items were then subject to an expert review procedure - several experienced physiotherapists involved in educating physiotherapists in cognitive behavioural approaches and researchers in the field of chronic pain were consulted. Two important criteria for this expert-validity procedure were: 1) items should be unambiguous; 2) items should be able to discriminate between different treatment orientations". 6 of 37 items were excluded, yielding the final 31-item questionnaire	Attitudes and beliefs towards CLBP	Pain ↔ harm/damage Prognosis/natural history of condition Attribution/causality Ability to/necessity for (precise) diagnosis Treatment Focus/aim of treatment Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest (therapeutic use of/as treatment) Determinants of outcome
Overmeer et al 2009	RCT, PTs; Sweden; pain patients	PABS (19-item) HC-PAIRS	Standardised measures of attitudes and beliefs	Beliefs, attitudes, knowledge, skills and behaviour	Pain ↔ harm/damage Prognosis/natural history of condition Impact Attribution/causality Treatment Focus/aim of treatment

					Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest (therapeutic use of/as treatment) Determinants of outcome Expectations
Phelan et al 2009	Cross-sectional, observational study; physicians; primary care; USA; CLBP	No	Written vignette plus an 11 item questionnaire measuring the likelihood they would use specific clinical actions. No information provided about the origin of items.	Positive attitude towards opioids Negative attitude towards treating pain Belief that pain always has a physical reason or source	Attribution/causality Treatment Clinician confidence and comfort (with managing NSMSK pain)
Pincus et al 2007	ABS-mp validation study; chiropractors, osteopaths and PT; UK; LBP	ABS-mp	Validation of the ABS-mp involved a random sample of 3 HC professions. Development of the instrument has previously been reported elsewhere (Pincus 2006)	ABS-mp specified structure (2 sections): Personal Interaction Attitudes (4 factors): Limitations on sessions, Psychological, Connection to health care system, Confidence and concern. Treatment Orientation Attitudes (2	Prognosis/natural history of condition Attribution/causality Focus/aim of treatment Role of clinician or (desirable) clinical actions/behaviours Pain ↔ 'normal' (physical) activity/function Clinician confidence and comfort (with managing NSMSK pain)

				factors): Re-activation, Biomedical (Should keep constituent items together)	
Pincus et al 2011	A cross-sectional, observational study; MSK practitioners; UK; CLBP	ABS-mp and ABS-work	Standardised measures of attitudes and beliefs	ABS-mp explores general beliefs about LBP (reported above); ABS-work specified structure (4 factors): Work benefit, Employers are helpful, Communication with employer, Work is a threat	Prognosis/natural history of condition Attribution/causality Focus/aim of treatment Role of clinician or (desirable) clinical actions/behaviours Pain ↔ 'normal' (physical) activity/function Clinician confidence and comfort (with managing NSMSK pain) Work
Poiraudeau et al 2006	Rheumatologists Secondary care France Subacute/persistent LBP - but ?items on part 4 of questionnaire refer to chronic LBP	FABQ	Comprises two independent subscales: the FABQ-phys assesses attitudes and beliefs about general physical activities (four items, range of scores 0–24); the FABQ-work assesses attitudes and beliefs about occupational activities (seven items, range of scores 0–42). Each item is scored from 0 'do not agree at all' to 6 'completely agree'. For both subscales, a low score indicates low fear-avoidance attitudes and beliefs, and a score of 14 or more on the FABQ phys scale indicates strong beliefs [16, 17]. This questionnaire has been validated in	Fear-avoidance beliefs	Pain ↔ 'normal' (physical) activity/function Expectations Work

			English [16], German [18] and, recently, French [19].		
Rainville et al 1995	Validation study; HCPs; primary care; USA; CLBP	HC-PAIRS ('development paper')	Modification of the PAIRS by modifying all first person references with “chronic back pain patients”. It was assumed that this would then reflect HCPs attitudes and beliefs towards LBP patients.	Attitudes and beliefs about the degree to which LBP justifies impairment and disability; functional expectation	Impact Pain ↔ 'normal' (physical) activity/function Expectations
Rainville et al 2000	Cross-sectional observational study	HC-PAIRS	Standardised measure of attitudes and beliefs	Attitudes and beliefs about the degree to which LBP justifies impairment and disability; functional expectation	Impact Pain ↔ 'normal' (physical) activity/function Expectations
Sieben et al 2009	Secondary analysis from a longitudinal cohort study;	HC-PAIRS, TSK-HC,	Standardised measures of attitudes and beliefs	Attitudes and beliefs about the degree to which LBP justifies impairment and disability; Functional expectations Beliefs about harmfulness of physical activity for (LBP) patients	Pain ↔ harm/damage Prognosis/natural history of condition Impact Pain ↔ 'normal' (physical) activity/function Expectations Clinicians' perceptions of what patients think
Silcock et al 2007	Cross-sectional observational study; Pharmacists; UK; Chronic LBP	BBQ	Also used was a questionnaire designed for anonymous self-completion and organised in five sections: 1) demographic questions about the respondents 2) attitudes towards back pain and its treatment	Attitudes, knowledge and reported practice of English pharmacists advising people	Treatment Pain ↔ 'normal' (physical) activity/function Work

			3) frequency and quality of back pain advice in the pharmacy 4) clinical case studies (2 vignettes) 5) education and training needs Attitudes were also measured with) questions mainly based on Working Backs Scotland (WBS). Two questions were taken directly from the WBS campaign; one question about returning to work was adapted from Buchbinder [13]; and a new question about using painkillers was written (table 2). Participants were invited to respond to these questions on a 5-point Likert scale similar to that employed by the BBQ.	who present with acute or chronic low back pain.	
Slater et al 2010/12	Longitudinal cohort study; GPs; Primary care; Perth, Australia; NSLBP	HC-PAIRS (13-ITEM VERSION)	Standardised measure of attitudes and beliefs	health care providers' attitudes and beliefs about the relationship between back pain and impairment	Impact Pain ↔ 'normal' (physical) activity/function Expectations
Smucker et al 1998	Physicians and chiropractors Private practices and a "group model health maintenance organisation Acute LBP	No	Questionnaire contained 10 items to measure aspects of practitioner confidence and attitudes in assessing and treating patients with LBP. Measure reported as being the same as Bush et al. 1993.	Yes - 4 items form "practitioner self-confidence score"	Attribution/causality Role of clinician or (desirable) clinical actions/behaviours Expectations Clinician confidence and comfort (with managing NSMSK pain)
Vonk et al 2009	Secondary analyses from 2 RCTs; PTs; Netherlands Sub-acute/chronic NP	PABS - 19-item (Houben) version	PABS-PT - cite that used 19 item version (Houben et al 2005). To make the questionnaire suitable for the present study we replaced 'low back pain' with 'neck pain'.	biomedical and biopsychosocial approaches of PTs towards neck pain	Pain ↔ harm/damage Attribution/causality Treatment

					Focus/aim of treatment Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest (therapeutic use of/as treatment) Determinants of outcome
Watson et al 2008	Cross-sectional observational study; GPs; Jersey, UK; Primary care; LBP	PABS-GP (17 items)	All participants were sent a version of the PABS adapted from Ostelo et al. (2003) and Houben et al. (2005b) and included all items previously validated. The PABS consists of two subscales: biomedical orientation and psychosocial orientation.	The relationship between attitudes and beliefs and sickness absence certification	Pain ↔ harm/damage Attribution/causality Treatment Focus/aim of treatment Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest (therapeutic use of/as treatment) Determinants of outcome
Werner et al 2005	(General population) and healthcare providers (in 3 counties): physicians, physiotherapists and chiropractors. Norway (Acute) LBP	No	6 statements based on main messages of the Norwegian guidelines for acute back pain; with a 5 point agreement scale. Three based on Deyo's 7 myths, 3 based on main messages of project media campaign. Translated into Norwegian and amended slightly for the two populations - public and HCPs.	Beliefs about LBP	Prognosis/natural history of condition Ability to/necessity for (precise) diagnosis Treatment Prescribed exercise and rest

					(therapeutic use of/as treatment) Determinants of outcome Work
Werner et al 2008	Doctors, PTS and chiropractors Primary care Norway (Acute) LBP	No	Level of agreement with five statements based on the main messages of the media campaign and Norwegian guidelines for acute back pain. Two additional items were included based on Deyo's seven myths about back pain. All survey item responses were recorded on a five-point Likert scale. Responses were categorized into disagree (totally disagree and disagree), unsure (neither disagree nor agree), or agree (agree and totally agree).	Back pain beliefs	Prognosis/natural history of condition Attribution/causality Ability to/necessity for (precise) diagnosis Treatment Determinants of outcome Work
Wolff et al 1991	Cross-sectional observational study, PTs;	No	The Chronic Pain Knowledge/Attitude Test is based on treatment objectives written by the authors based on a literature review, personal experience, and discussions with clinical experts. Consists of 18 questions addressing the pain knowledge, 10 addressing attitude, 3 demographic questions and 5 educational information questions.	PT's (knowledge and) attitudes about chronic pain - 7/27 items = "attitude"	Pain ↔ harm/damage Impact Treatment Clinician confidence and comfort (with managing NSMSK pain)
Additional 12 studies following updated searches (January 2012 to December 2015)					
Dalkilinc et al 2014	Validity/ reliability study; 84 Turkish PTs; painful musculoskeletal conditions	PABS-PT TSK	Following translation of the PABS (Ostelo et al, 2003) into a Turkish version, PTs were asked to complete the Turkish versions of the PABS and TSK	To perform a linguistic and cultural translation of the PABS-PT into the Turkish language and to examine its validity and reliability	Pain ↔ harm/damage Prognosis/natural history of condition Attribution/causality Treatment Focus/aim of treatment

					Pain ↔ 'normal' (physical) activity/function Determinants of outcome Clinicians' perceptions of what patients think
Gremeaux et al 2015	Cross-sectional, observational study; 112 teaching GPs; regional medical school; France LBP	FABQ BBQ	All participants were emailed French versions of the FABQ and the BBQ. Wording was slightly modified to suit healthcare professionals.	To determine TGPs fear- avoidance beliefs about LBP and to investigate the impact of these beliefs on the way they followed guidelines for bed rest, physical activity maintenance, pharmacological and nonpharmacological prescription and sick leave.	Prognosis/natural history of condition Impact Treatment Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest (therapeutic use of/as treatment) Expectations Work
Hirsh et al 2014	Cross-sectional, observational study; 50 physicians and 35 medical students; Midwestern metropolitan area; USA; chronic pain (including LBP)and depression	Medical Condition Regard Scale (MCRS)	All participants accessed a web-based study site. They completed a demographic questionnaire, treatment decisions in relation to 10 possible vignettes, the MCRS, and a depression attitudes questionnaire (DAQ)	The current study investigated clinicians' treatment preferences for chronic pain and depression and the extent to which these preferences	Clinician confidence and comfort with managing common MSK pain conditions

				were related to clinicians' experience and attitudes towards chronic pain and depression	
Innes et al 2015	Cross-sectional, observational study, 750 chiropractors, Victoria, Australia; persistent LBP	PABS-PT (19 item)	All participants were mailed a survey consisting of 10 demographic questions and the PABS-PT (Houben et al, 2005)	To determine chiropractors would demonstrate similar attitudes and beliefs to other manual therapists' biopsychosocial or biomedical approach to the management of their patients.	Pain ↔ harm/damage Prognosis/natural history of condition Attribution/causality Treatment Focus/aim of treatment Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest (therapeutic use of/as treatment) Determinants of outcome
Mackey and Hurley 2014	Cross-sectional observational study; 25 PT students and 22 graduate PTs; Dublin, Ireland; LBP	PABS-PT	Participants were asked to complete an online survey which included demographics, 19 item PABS-PT (Houben et al, 2005) and questions about a clinical vignette	To determine differences in biomedical and biopsychosocial orientations between stage three PT students and recently graduated PTs.	Pain ↔ harm/damage Prognosis/natural history of condition Attribution/causality Treatment Focus/aim of treatment Pain ↔ 'normal' (physical) activity/function

					Prescribed exercise and rest (therapeutic use of/as treatment) Determinants of outcome
Magelhaes et al 2012	Cross-sectional, observational study; 100 PTs from 4 Brazilian cities, CLBP	PABS-PT HC-PAIRS	PTs were asked to complete two self-report scales for the assessment of their attitudes and beliefs about chronic low back pain: the Brazilian-Portuguese version of HC-PAIRS (Rainville et al 1995) and the PABS-PT (Houben et al 2004)	To measure the attitudes and beliefs of Brazilian physical therapists towards the development and maintenance of chronic low back pain.	Pain ↔ harm/damage Prognosis/natural history of condition Impact Attribution/causality Treatment Focus/aim of treatment Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest (therapeutic use of/as treatment) Determinants of outcome Expectations
O'Sullivan et al 2013	Longitudinal experimental study; 150 PTs attending a LBP workshop; Ireland, England Germany; LBP	BBQ	PTs were asked to complete the BBQ at the beginning of a Cognitive Functional Therapy workshop and again 3 months later.	To examine whether brief educational LBP workshops which consider LBP from a biopsychosocial perspective are an effective	Prognosis/natural history of condition Treatment Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest

				means of modifying the LBP beliefs of qualified physiotherapists	(therapeutic use of/as treatment) Work
Simmonds et al 2012	Cross-sectional observational study; 108 Canadian PTs; Quebec; LBP	PABS-PT	PTs completed the French 19-item version of the PABS-PT (Ostelo et al, 2003),	To characterize PTs' knowledge, attitudes, and beliefs about LBP and its management.	Pain ↔ harm/damage Prognosis/natural history of condition Attribution/causality Treatment Focus/aim of treatment Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest (therapeutic use of/as treatment) Determinants of outcome
Sit et al 2014	Cross-sectional observational study; 156 Physicians; Hong Kong; CLBP	PABS-PT	Physicians completed an online survey including the 19 item PABS-PT (Houben et al, 2005)	To evaluate the attitudes and beliefs towards chronic low back pain among primary care physicians in Asia	Pain ↔ harm/damage Prognosis/natural history of condition Attribution/causality Treatment Focus/aim of treatment Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest

					(therapeutic use of/as treatment) Determinants of outcome
Tan et al 2014	Cross-sectional observational study; 432 HCPs; various healthcare settings in Shanghai, China; LBP	BBQ FABQ	All participants completed either Simplified Chinese or English versions of a self-report sociodemographic questionnaire and the BBQ. All participants with a history of LBP completed the FABQ and a variety of instruments which assessed their LBP status, severity and impact using the Nordic Musculoskeletal Questionnaire (NMQ), a Visual Analogue Scale (VAS), and the Roland Morris Disability Questionnaire (RMDQ).	To examine the associations between LBP-related beliefs among Chinese HCPs and characteristics of these HCPs.	Prognosis/natural history of condition Impact Treatment Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest (therapeutic use of/as treatment) Expectations Work
Tan et al 2015	Cross-sectional observational study; 109 Chinese nurses and 165 Australian nurses; various healthcare settings in Shanghai, China and Australia; LBP	BBQ HC-PAIRS FABQ	All participants completed Simplified Chinese versions of a self-report sociodemographic questionnaire, the BBQ and the HC-PAIRS. All participants with a history of LBP completed the FABQ, a Visual Analogue Scale (VAS), and the Roland Morris Disability Questionnaire (RMDQ).	To compare the three measures of back pain beliefs in a sample of Chinese nurses working in mainland China and a sample of Caucasian nurses working in Australia and to determine the associations of these beliefs with self-reported LBP-related disability in	Prognosis/natural history of condition Impact Treatment Pain ↔ 'normal' (physical) activity/function Prescribed exercise and rest (therapeutic use of/as treatment) Expectations Work

				nurses with history of LBP.	

ABS-mp = Attitudes to Back Pain Scale for Musculoskeletal practitioners
ABS-work = Attitudes to Back Pain Scale in relation to work
BBQ-HC = Back Beliefs Questionnaire – Health care provider
Biopsychosocial = Biopsychosocial
COST = (European) Cooperation in Science and Technology
CLBP = Chronic low back pain
FABQ = Fear Avoidance Beliefs Questionnaire
GP = General Practitioner
HC-PAIRS= Health Care Provider's Pain and Impairment Relationship Scale
HCP = Healthcare practitioner
LBP = Low back pain
MIS = Minimal intervention strategy
MSK = musculoskeletal
NS = none specific
NSBP = Non specific back pain
OT= Occupational therapist
PABS = Pain Attitude and Beliefs Scale
PCA = Principal Component Analysis
PCS = Pain Catastrophising Scale
PT = Physiotherapist
RCGP = Royal College of General Practitioners
RTA = Road traffic accident
STI = Soft tissue injuries
TSK-HC (PHODA) = Tampa Scale of Kinesiophobia (Photograph series of daily activites)
USA = United States of America
WBS = Working Backs Scotland
WCB = Workers Compensation Boards

Appendix 5 - Unique items representing the nine most prevalent constructs

Second-order construct	First-order construct	Unique item	Total no. of uses	Origin/first use	Development	?Subsequent uses
The pain – normal (physical) activity relationship	Beneficial (positive/not harmful)	If ADL activities cause more back pain, this is not dangerous	6	Ostelo 2003	TSK	Houben et al 2005b - PABS Bishop et al 2008 Overmeer 2009 PABS Vonk 2009 Derghazarian/Simmonds 2011
		A bad back should be exercised	2	Houben et al 2005b	BBQ	Chen 2011 - BBQ
		Although my condition is painful, I would be better off if I were physically active AND My pain would probably be relieved if I were to exercise	2	Houben et al 2005b	TSK	Sieben 2009
	Harmful (negative - should be limited/avoided)	An increase in pain is an indicator that a chronic back pain patient should stop what he is doing until the pain decreases	10	Rainville et al 1995	HC-PAIRS	Rainville et al 2000 Ostelo 2003 Overmeer 2009 HC-PAIRS Sieben 2009 HC-PAIRS Evans 2010 Chen 2011 HC-PAIRS Slater 2012 Houben 2004 Houben 2005b
		Chronic back pain patients cannot go about normal life activities when they are in pain	9	Rainville et al 1995	HC-PAIRS	Rainville et al 2000 Houben 2004 Houben 2005b PAIRS Overmeer 2009 HC-PAIRS

						Sieben 2009 HC-PAIRS Evans 2010 Chen 2011 HC-PAIRS Slater 2012
		If their pain would go away, chronic back pain patients would be every bit as active as they used to be	9	Rainville et al 1995	HC-PAIRS	Rainville et al 2000 Houben 2004 Houben 2005b PAIRS Overmeer 2009 HC-PAIRS Sieben 2009 HC-PAIRS Evans 2010 Chen 2011 HC-PAIRS Slater 2012
		Chronic back pain patients have to be careful not to do anything that might make their pain worse AND Patients who have suffered back pain should avoid activities that stress the back	8 7	Rainville et al 1995 Ostelo 2003	HC-PAIRS FABQ	Rainville et al 2000 Houben et al 2005b PAIRS Overmeer 2009 HC-PAIRS Sieben 2009 HC-PAIRS Evans 2010 Chen 2011 HC-PAIRS Slater 2012 Houben 2004 Houben 2005b Watson 2008 Bowey-Morris 2010 Fullen 2011 Morris/ Watson 2011
		There is no way that chronic back pain patients can return to doing the things that they used to do unless they first find a cure for their pain	9	Rainville et al 1995	HC-PAIRS	Rainville et al 2000 Houben 2004 Houben 2005b PAIRS Overmeer 2009 HC-PAIRS Sieben 2009 HC-PAIRS Evans 2010 Chen 2011 HC-PAIRS Slater 2012

		The best advice for back pain is: 'Take care' and 'Make no unnecessary movements'	6	Ostelo 2003	TSK	Houben 2005b Watson 2008 Bowey-Morris 2010 Fullen 2011 Morris/ Watson 2011
		Sport should not be recommended for patients with back pain	2	Ostelo 2003	TSK	Houben et al 2005b
		If ADL activities cause more back pain, this is not dangerous	1	Houben et al 2005b	TSK	
		If I were to overcome it, my pain would increase	1	Sieben 2009	TSK	
		Simply being careful that I do not make any unnecessary movements is the safest thing I can do to prevent my pain from worsening	1	Sieben 2009	TSK	
		It's really not safe for a person with a condition like mine to be physically active	1	Sieben 2009	TSK	
		No one should have to exercise when he/she is in pain	1	Sieben 2009	TSK	
Treatment (including focus/aim of treatment)	Belief in) the availability/efficacy of a specific treatment (type) - including 'alternative'	Effective therapeutic interventions are available for most patients with low back pain	1	Cherkin et al 1988	derived through discussion with physicians and chiropractors	

		Choose the one statement which comes closest to describing your feelings about the possible benefits of physical therapy for this patient. Therapy may/will: a) Prevent another surgery b) Help the patient to manage his pain more effectively c) Not be beneficial for pain management d) Probably make no change in the patient's course	1	Wolff et al 1991	Chronic pain knowledge and attitude test	
		The following treatment modalities are effective in the management of most patients with acute LBP: Ice, Heat, Ultrasound, Mechanical traction, TENS, Mobilization, Manipulation, Acupuncture	1	Li and Bombardier et al 2001	Derived from a questionnaire about beliefs regarding treatment of LBP	
		Back education programs aimed at educating workers in safe lifting techniques are effective in reducing recurrences of LBP	1	Li and Bombardier et al 2001	Derived from a questionnaire about beliefs regarding treatment of LBP	
		Specific interventions physicians <u>believed</u> would	1	Guzman et al 2002	Developed through meetings with	

		help recovery and reduce work disability among workers with uncomplicated low back pain of 2 days' duration			physicians and labour. Management and WCB representatives	
		Good posture prevents back pain	2	Ostelo 2003	Item considered relevant by the authors	Houben et al 2005b PABS
		There is no effective treatment to eliminate back pain	10	Ostelo 2003	BBQ	Houben et al 2005b PABS Bishop et al 2008 Watson 2008 Overmeer 2009 Vonk 2009 Bowey-Morris 2010 Derghazarian/Simmonds 2011 Fullen 2011 Morris/ Watson 2011
		TENS and/or back braces support functional recovery	2	Ostelo 2003	Item considered relevant by the authors	Houben et al 2005b PABS
		Disc herniation should in most cases have surgery.	2	Werner et al 2005	Statement based on messages derived from Norwegian guidelines for LBP	Werner 2008
		Surgery is the most effective way to treat back trouble	2	Houben et al 2005b	BBQ	Chen 2011 – BBQ
		Alternative treatments are the answer to back trouble	2	Houben et al 2005b	BBQ	Chen 2011 – BBQ
		Medication if the only way of relieving back trouble	2	Houben et al 2005b	BBQ	Chen 2011 – BBQ

	Belief in/use of placebo effect	I often deliberately take advantage of the placebo effect to help my patients with back pain feel better	1	Battie et al 1994	derived through discussion with physicians and chiropractors	
		Many of the physical therapy interventions used for back pain have only a placebo benefit	1	Battie et al 1994	derived through discussion with physicians and chiropractors	
	Limitation of treatment (no 'real' treatment)	The most important thing to do for patients with low back pain is to make them comfortable while nature takes its course	1	Cherkin et al 1988	derived through discussion with physicians and chiropractors	
		There is no real treatment for back trouble AND Any treatment by a doctor, physiotherapist, or chiropractor is merely symptomatic pain relieving	1 1	Houben et al 2005b Werner 2008	BBQ Statement based on messages derived from Norwegian guidelines for LBP	
		Doctors cannot do anything for back trouble	1	Houben et al 2005b	BBQ	
	Focus = pain reduction	It is the task of the physiotherapist to remove the cause of back pain	2	Ostelo 2003	Item considered relevant by the authors	Houben et al 2005b PABS
	Treatment is/is not pain contingent	If a movement increases the pain, I advise my patients to avoid it AND If back pain increases in severity, I immediately adjust the intensity of my treatment accordingly	5 6	Linton 2002 Ostelo 2003	Either TSK, FABQ or the PAIRS: unclear which Item considered relevant by the authors	Houben et al 2005b PABS Bishop et al 2008 Watson 2008 Overmeer 2009 PABS Vonk 2009 Bowey-Morris 2010 Derghazarian/Simmonds 2011

						Fullen 2011 Morris/ Watson 2011
		Treatment can be successful even if the pain persists	7	Linton 2002	Either TSK, FABQ or the PAIRS: unclear which	Ostelo 2003 PABS Houben et al 2005b PABS Bishop et al 2008 Overmeer 2009 PABS Vonk 2009 Derghazarian/Simmonds 2011
		Patients with back pain should preferably practice only pain free movements	10	Ostelo 2003	FABQ	Houben et al 2005b PABS Bishop et al 2008 Watson 2008 Overmeer 2009 PABS Vonk 2009 Bowey-Morris 2010 Derghazarian/Simmonds 2011 Fullen 2011 Morris/ Watson 2011
		Pain reduction is a precondition for the restoration of normal functioning	10	Ostelo 2003	Item considered relevant by the authors	Houben et al 2005b PABS Bishop et al 2008 Watson 2008 Overmeer 2009 PABS Vonk 2009 Bowey-Morris 2010 Derghazarian/Simmonds 2011 Fullen 2011 Morris/ Watson 2011
		Even if the pain has worsened, the intensity of the next treatment can be increased	4	Houben et al 2005b PABS	Item considered relevant by the authors	Bishop et al 2008 Overmeer 2009 PABS Vonk 2009

						Derghazarian/Simmonds 2011
	Focus = (restoration of) function	I advise my patient with back pain to continue with their daily activities even if it hurts	1	Linton 2002	Either TSK, FABQ or the PAIRS: unclear which	
		Therapy can completely alleviate the functional symptoms caused by back pain	2	Ostelo 2003	Item considered relevant by the authors	Houben et al 2005b PABS
		A rapid resumption of daily activities is an important goal of the treatment	1	Houben et al 2005b PABS	Item considered relevant by the authors	
Work	Work - symptoms (effect of work on symptoms and, usually, symptoms on *ability* to work)	Repeated injury should trigger workplace intervention	1	Guzman et al 2002	Through meeting with physicians, labour, management and WCB representatives	
		Pain reduction is a prerequisite for returning to normal work	1	Linton 2002	Either TSK, FABQ or the PAIRS: unclear which	
		Patients with monotonous or heavy jobs should not work when they have pain	1	Linton 2002	Either TSK, FABQ or the PAIRS: unclear which	
		Patients should not return to work until they are almost pain free	1	Chaudary 2004	Based on the RCGP clinical guidelines and back book	
		Back trouble will eventually stop (you) from working	2	Houben et al 2005b	BBQ	Chen 2011 – BBQ
		Back trouble means long periods of time off work	2	Houben et al 2005b	BBQ	Chen 2011 – BBQ

	Work - individual (essentially, effect of attributes of individual and ability/likelihood/inclination to work	Worker satisfaction with job helps recovery	1	Guzman et al 2002	Through meeting with physicians, labour, management and WCB representatives	
		Employee's reluctance to try modified work requires assessment of personal and workplace issues	1	Guzman et al 2002	Through meeting with physicians, labour, management and WCB representatives	
		Patients' belief that passive treatments will help often hinders recovery	1	Guzman et al 2002	Through meeting with physicians, labour, management and WCB representatives	
		Personal and family difficulties are common reasons for not returning to work	1	Guzman et al 2002	Through meeting with physicians, labour, management and WCB representatives	
		Patients' belief that hurt equals harm often hinders recovery	1	Guzman et al 2002	Through meeting with physicians, labour, management and WCB representatives	
	Role of clinician/clinical intervention	Physicians' awareness of employer's return-to-work and other programs will help recovery	1	Guzman et al 2002	Through meeting with physicians, labour, management and WCB representatives	
		Return-to-work plans should be made only after a few visits to a physician	1	Guzman et al 2002	Through meeting with physicians, labour, management	

					and WCB representatives	
		Intensive clinical treatment during the first month after injury decreases disability	1	Guzman et al 2002	Through meeting with physicians, labour, management and WCB representatives	
		Physicians have an important role in return-to-work planning	1	Guzman et al 2002	Through meeting with physicians, labour, management and WCB representatives	
		Extensive clinical testing during the first month after injury decreases disability	1	Guzman et al 2002	Through meeting with physicians, labour, management and WCB representatives	
	Role of employer	Employers determine whether physicians' recommendations for modified duties can be accommodated	1	Guzman et al 2002	Through meeting with physicians, labour, management and WCB representatives	
		Employers' contacting workers soon after injuries will prolong disability	1	Guzman et al 2002	Through meeting with physicians, labour, management and WCB representatives	
	Communication	Good communication among clinicians, employers, insurers, and injured workers can significantly decrease disability	1	Guzman et al 2002	Through meeting with physicians, labour, management and WCB representatives	

		Patients are entitled to a copy of all return-to-work reports	1	Guzman et al 2002	Through meeting with physicians, labour, management and WCB representatives	
	Importance of early RTW	One recovers faster from back pain if one continues at work or returns as soon as possible	2	Werner et al 2005	Statement based on messages derived from Norwegian guidelines for LBP	Werner et al 2008
Attribution/causality	Existence of an 'exact cause'	Not enough effort is made to find the underlying organic causes of back pain	6	Ostelo 2003	Item considered relevant by the authors	Houben et al 2005b PABS Watson 2008 Bowey-Morris 2010 Fullen 2011 Morris/ Watson 2011
		Most often, it will be possible to find an exact cause of the pain	1	Werner 2008	Statement based on messages derived from Norwegian guidelines for LBP	
	Structural/physical cause (absence or presence)	Attribution/cause of back pain (muscle strain, vertebral subluxation, facet joint syndrome, disc problem, spinal arthritis, psychosomatic, other) reported under beliefs and attitudes.	2	Cherkin et al 1988	derived through discussion with physicians and chiropractors	Battie et al 1994
		There is nothing physically wrong with many patients who complain of low back pain	4	Cherkin et al 1988	derived through discussion with physicians and chiropractors	Battie et al 1994 Curtis et al 1997 Smucker et al 1998
		Unilateral physical stress is not a cause of back pain	2	Ostelo 2003	Item considered relevant by the authors	Houben et al 2005b PABS

		Back pain indicates the presence of organic injury	10	Ostelo 2003	TSK	Houben et al 2005b PABS Bishop et al 2008 Watson 2008 Overmeer 2009 Vonk 2009 Bowey-Morris 2010 Derghazarian/Simmonds 2011 Fullen 2011 Morris/ Watson 2011
	Psychosocial (incl. stress)	Mental stress can cause back pain even if there is no organic damage	11	Linton 2002	Either TSK, FABQ or the PAIRS: unclear which	Ostelo 2003 PABS Houben et al 2005b PABS Bishop et al 2008 Watson 2008 Overmeer 2009 PABS Vonk 2009 Bowey-Morris 2010 Derghazarian/Simmonds 2011 Fullen 2011 Morris/ Watson 2011
		Psychosocial factors can cause back pain	1	Linton 2002	Either TSK, FABQ or the PAIRS: unclear which	
	Unknown	The cause of back pain is unknown	10	Ostelo 2003	Item considered relevant by the authors	Houben et al 2005b PABS Bishop et al 2008 Watson 2008 Overmeer 2009 Vonk 2009 Bowey-Morris 2010 Derghazarian/Simmonds 2011 Fullen 2011

						Morris/ Watson 2011
	'Seriousness' of disease					
The pain - harm/damage relationship	N/A	The severity of the injury correlates directly to the severity of the pain AND Pain intensity is directly related to the degree of the injury AND The severity of tissue damage determines the level of pain	6 4 2	Wolff et al 1991 Linton et al 2002 Ostelo 2003	Chronic pain knowledge and attitude test Either TSK, FABQ or the PAIRS: unclear which Item considered relevant by the authors	Houben et al 2005b PABS Bishop et al 2008 Watson 2008 Overmeer 2009 PABS Vonk 2009 Bowey-Morris 2010 Derghazarian/Simmonds 2011 Fullen 2011 Morris/ Watson 2011
		If a patient complains of pain during an exercise, I worry that it might cause an injury. (TSK)	11	Linton 2002	Either TSK, FABQ or the PAIRS: unclear which	Ostelo 2003 Houben et al 2005b PABS Bishop et al 2008 Watson 2008 Overmeer PABS Vonk 2009 Bowey-Morris 2010 Derghazarian/Simmonds 2011 Fullen 2011 Morris/ Watson 2011
		Back pain suggests that something is seriously wrong with the back	3	Linton 2002	Either TSK, FABQ or the PAIRS: unclear which	Ostelo 2003 (PABS) Houben et al 2005b PABS
		Pain is a nociceptive stimulus, indicating tissue damage	10	Ostelo 2003	Item considered relevant by the authors	Houben et al 2005b PABS Bishop et al 2008 Watson 2008 Overmeer 2009 PABS Vonk 2009 Bowey-Morris 2010

						Derghazarian/Simmonds 2011 Fullen 2011 Morris/ Watson 2011
		Increased pain indicates new tissue damage or the spread of existing damage	10	Ostelo 2003	Item considered relevant by the authors	Houben et al 2005b PABS Bishop et al 2008 Watson 2008 Overmeer 2009 PABS Vonk 2009 Bowey-Morris 2010 Derghazarian/Simmonds 2011 Fullen 2011 Morris/ Watson 2011
		My body is telling me I have something dangerously wrong	2	Houben et al 2005b	TSK	Sieben 2009 TSK
		Pain always means I have injured my body	2	Houben et al 2005b	TSK	Sieben 2009 TSK
		Just because something aggravates my pain does not mean it is dangerous	2	Houben et al 2005b	TSK	Sieben 2009 TSK
		I wouldn't have this much pain if there wasn't something potentially dangerous going on in my	2	Houben et al 2005b	TSK	Sieben 2009 TSK
		Pain lets me know when to stop exercising so that I don't injure myself	2	Houben et al 2005b	TSK	Sieben 2009 TSK
		Even though something is causing me a lot of pain, I	2	Houben et al 2005b	TSK	Sieben 2009 TSK

		don't think it's actually dangerous				
Expectations	Outcome expectancy (especially work)					
	… of patients about what clinicians can do (for them)	Patients with LBP often have unrealistic expectations about what doctors can do for them	3	Bush et al 1993	Unclear	Battie et al 1994 Smucker et al 1998
	…and link to (patient) satisfaction					
	… of patients and influence on clinical behaviour	I am likely to order X-ray pictures because my patients expect me to do so	1	Chaudary 2004	Based on the RCGP clinical guidelines and back book	
	…of clinicians	Chronic back pain patients can still be expected to fulfill work and family responsibilities despite pain	8	Rainville et al 1995	HC-PAIRS	Rainville et al 2000 Houben 2005 Overmeer 2009 HC-PAIRS Sieben 2009 HC-PAIRS Evans 2010 Chen 2011 HC-PAIRS Slater 2012
		Chronic back pain patients owe it to themselves and those around them to perform their usual activities even when their pain is bad	9	Rainville et al 1995	HC-PAIRS	Rainville et al 2000 Houben 2004 Houben 2005 Overmeer 2009 HC-PAIRS Sieben 2009 HC-PAIRS Evans 2010 Chen 2011 HC-PAIRS Slater 2012
	… of others	Most people expect too much of chronic back pain patients, given their pain	8	Rainville et al 1995	HC-PAIRS	Rainville et al 2000 Houben 2005 Overmeer 2009 HC-PAIRS

						Sieben 2009 HC-PAIRS Evans 2010 Chen 2011 HC-PAIRS Slater 2012
		The cause of back pain is unknown	1	Houben et al 2005b	Item considered relevant by the authors	
		Chronic back pain patients can still be expected to fulfill work and family responsibilities despite pain	1	Houben et al 2005b	PAIRS	
		Chronic back pain patients owe it to themselves and those around them to perform their usual activities even when their pain is bad	1	Houben et al 2005b	PAIRS	
	… of patients for/of investigation and treatment)	Many of my back pain patients will be dissatisfied if I do not order an xray	4	Cherkin et al 1991	derived through discussion with physicians and chiropractors	Bush et al 1993 Curtis et al 1997 (Smucker et al 1998)
		Many of my patients will be dissatisfied if I give them information but provide no modality during their visit	1	Battie et al 1994	derived through discussion with physicians and chiropractors	
		Agree or strongly agree that LBP patients have unreal expectations	1	Curtis et al 1997	Derived from previous measures of physician confidence	
		I am likely to order xray pictures because patients expect me to do so	2	Buchbinder et al 2001	Modified from a questionnaire by Bombardier 1995	Chaudhary 2004

Clinician confidence and comfort (with managing common MSK pain)	Emotional response **(positive or negative)**	I find it rewarding to work with arthritis patients	1	DeVellis et al 1986	Derived from a questionnaire investigating therapists preferred learning methods	
		Working with arthritis patients makes good use of my professional skills	1	DeVellis et al 1986	Derived from a questionnaire investigating therapists preferred learning methods	
		I often feel frustrated by patients who want me to fix them	3	Cherkin et al 1988	derived through discussion with physicians and chiropractors	Cherkin et al 1991 Battie et al 1994
		I often have negative feelings about dealing with patients who have low back pain	7	Cherkin et al 1991	derived through discussion with physicians and chiropractors	Bush et al 1993 Battie et al 1994 Curtis et al 1997 Smucker et al 1998 Buchbinder et al 2001 Chaudary 2004
		How do you feel about working with patients with chronic pain versus other patients you treat who do not have chronic pain? a) I prefer to treat patients with chronic pain over patients with acute/sub-acute pain b) I prefer to treat patients with acute/sub-acute pain	1	Wolff et al 1991	Chronic pain knowledge and attitude test	

		over patients with chronic pain c) I do not have a preference for treating patients in regard to their pain				
	Perceived knowledge/skills/'tools	I feel that I can do a lot to help arthritis patients	1	DeVellis et al 1986	Derived from a questionnaire investigating therapists preferred learning methods	
		I know exactly what I need to do to effectively manage patients with LBP	2	Cherkin et al 1991	derived through discussion with physicians and chiropractors	Smucker et al 1998
		Agree or strongly agree that they lack the tools to assess low back pain	2	Curtis et al 1997	Derived from previous measures of physician confidence	Smucker et al 1998
		Agree or strongly agree that they know what to do to effectively treat LBP	1	Curtis et al 1997	Derived from previous measures of physician confidence	
	Clinician perception of their patients' satisfaction	Most of my back pain patients are very satisfied with my care for their back pain	5	Cherkin et al 1988	derived through discussion with physicians and chiropractors	Cherkin et al 1991 Bush et al 1993 Curtis et al 1997 Smucker et al 1998
	Confidence/preparedness and/or "comfort"	I find it easy to work with arthritis patients	1	DeVellis et al 1986	Derived from a questionnaire investigating therapists preferred learning methods	
		I am very comfortable managing patients with low back pain	5	Cherkin et al 1988	derived through discussion with	Cherkin et al 1991 Curtis et al 1997 Smucker et al 1998

					physicians and chiropractors	Li and Bombardier 2001
		Chronic pain is a multi-faceted problem. As a physical therapist which of the following are you willing to address? a) The sensory component b) The emotional component c) The functional component d) A and C e) All of the above	1	Wolff et al 1991	Chronic pain knowledge and attitude test	
		Feel very well or well prepared to manage LBP now	2	Curtis et al 1997	Derived from previous measures of physician confidence	Smucker et al 1998
		I can predict the patients who will develop chronic pain problems	1	Linton 2002	Either TSK, FABQ or the PAIRS: unclear which	
Prognosis/ natural history of condition	Self-limiting/spontaneous recovery/positive	Most low back pain will resolve itself within a few weeks without professional help AND In most cases, back pain recovers spontaneously in a couple of weeks, no matter what we do	1 2	Cherkin et al 1988 Werner et al 2005	derived through discussion with physicians and chiropractors Statement based on messages derived from Norwegian guidelines for LBP	 Werner et al 2008
		Back pain recovers best by itself.	2	Werner et al 2005	Statement based on messages derived	Werner et al 2008

					from Norwegian guidelines for LBP	
	Likelihood of chronicity/negative	Few workers will recover on their own within a month after a soft-tissue injury	1	Guzman et al 2002	Through meeting with physicians, labour, management and WCB representatives	
		Back trouble means periods of pain for the rest of (one's) life	2	Houben et al 2005b	BBQ	Chen 2011 BBQ
		Later in life back trouble gets progressively worse	2	Houben et al 2005b	BBQ	Chen 2011 BBQ
	Future risk/vulnerability	If therapy does not result in a reduction in back pain, there is a high risk of severe restrictions in the long term	6	Ostelo 2003	BBQ	Houben et al 2005b PABS Bishop et al 2008 Overmeer 2009 PABS Vonk 2009 Derghazarian/Simmonds 2011
		In the long run, patients with back pain have a higher risk of developing spinal impairments	5	Houben et al 2005b	Item considered relevant by the authors	Bishop et al 2008 Overmeer 2009 PABS Vonk 2009 Derghazarian/Simmonds 2011
		Later in life back trouble gets progressively worse	1	Houben et al 2005b	BBQ	
		Once (you) have had back trouble there is always a weakness	1	Houben et al 2005b	BBQ	
		My accident has put my body at risk for the rest of my life	1	Houben et al 2005b	TSK	Sieben 2009 TSK
		I can't do all the things normal people do because	1	Houben et al 2005b	TSK	Sieben 2009 TSK

		it's too easy for me to get injured				
Impact of condition	(Dis)ability/function	Chronic pain usually results in chronic disability	1	Wolff et al 1991	Chronic pain knowledge and attitude test	
		When their pain gets worse, chronic back pain patients find it very hard to concentrate on anything else	6	Rainville et al 1995	HC-PAIRS (15 item only)	Rainville et al 2000 Houben 2004 Overmeer 2009 HC-PAIRS Sieben 2009 HC-PAIRS Chen 2011 HC-PAIRS
	Quality of life	As long as they are in pain, chronic back pain patients will never live as well as they did before	9	Rainville et al 1995	HC-PAIRS	Rainville et al 2000 Houben 2004 Houben 2005 Overmeer 2009 HC-PAIRS Sieben 2009 HC-PAIRS Evans 2010 Chen 2011 HC-PAIRS Slater 2012
		Chronic back pain patients find themselves frequently thinking about their pain and what it has done to their life	6	Rainville et al 1995	HC-PAIRS (15 item only)	Rainville et al 2000 Houben 2004 Overmeer 2009 HC-PAIRS Sieben 2009 HC-PAIRS Chen 2011 HC-PAIRS
		All of chronic back pain patients problems would be solved if their pain would go away	9	Rainville et al 1995	HC-PAIRS	Rainville et al 2000 Houben 2004 Houben 2005 Overmeer 2009 HC-PAIRS Sieben 2009 HC-PAIRS Evans 2010 Chen 2011 HC-PAIRS Slater 2012
		Back trouble makes everything in life worse	1	Chen 2011	BBQ	

Determinants of outcome	Psychosocial factors - including patient motivation, patient beliefs, learning to cope with stress	Well motivated patients are unlikely to have long term problems	2	Buchbinder et al 2001	Modified from a questionnaire by Bombardier 1995	Chaudhary 2004
		Functional limitations associated with back pain are the result of psychosocial factors	10	Ostelo 2003	Item considered relevant by the authors	Houben et al 2005b Bishop et al 2008 Watson 2008 Overmeer 2009 PABS Vonk 2009 Bowey-Morris 2010 Derghazarian/Simmonds 2011 Fullen 2011 Morris/ Watson 2011
		The way patients view their pain influences the progress of the symptoms	2	Ostelo 2003	Item considered relevant by the authors	Houben et al 2005b
		Learning to cope with stress promotes recovery from back pain	9	Houben et al 2005b	Item considered relevant by the authors	Bishop et al 2008 Watson 2008 Overmeer 2009 PABS Vonk 2009 Bowey-Morris 2010 Derghazarian/Simmonds 2011 Fullen 2011 Morris/ Watson 2011
	Understanding/explanation	Patients with back pain given a clear explanation of the cause of their problem are likely to do better	1	Battie et al 1994	derived through discussion with physicians and chiropractors	
		A patient who understands how to care for his or her	1	Battie et al 1994	derived through discussion with	

		back will have fewer repeated episodes of pain			physicians and chiropractors	
	(Return to) normal activity/work	Encouragement of physical activity is important in the recovery from LBP	2	Li and Bombardier 2001	Derived from a questionnaire about beliefs regarding treatment of LBP	Chaudhary 2004
		One recovers faster from back pain if one continues at work or returns as soon as possible	2	Werner et al 2005	Statement based on messages derived from Norwegian guidelines for LBP	Werner 2008
Role of clinician or (desirable) clinical actions/behaviours	Provision of information/reassurance	I assure patients with low back pain that their pain will go away within a few weeks	2	Cherkin et al 1988	derived through discussion with physicians and chiropractors	Cherkin et al 1991
		I strongly reassure most of my back pain patients that they do not have serious disease	1	Cherkin et al 1991	Details of development is unclear	
		I always provide my patients with clear instructions about activities, e.g. what they should and should not do	1	Linton 2002	Either TSK, FABQ or the PAIRS: unclear which	
		I always provide advice and instructions about pain management	1	Linton 2002	Either TSK, FABQ or the PAIRS: unclear which	
	Secondary prevention/prevention of chronicity	Doctors [MD or DC] can do a lot to prevent patients with acute back pain from developing chronic back pain	3	Cherkin et al 1988	derived through discussion with physicians and chiropractors	Curtis et al 1997 Smucker et al 1998

	Exploring/supporting patients' psychological difficulties					
Prescribed exercise and rest (therapeutic use of/as treatment)	N/A	Patients with acute LBP should be prescribed complete bed rest until pain goes away AND Back pain should be treated with bedrest until the pain is substantial(ly) less. AND Back trouble must be rested	2 1 2	Li and Bombardier 2001 Werner et al 2005 Houben et al 2005b	Derived from a questionnaire about beliefs regarding treatment of LBP Statement based on messages derived from Norwegian guidelines for LBP BBQ	Chaudhary 2004 Chen 2011 – BBQ
		Sick leave is a good treatment for back pain	1	Linton 2002	Either TSK, FABQ or the PAIRS: unclear which	
		Reduction of daily physical exertion is a significant factor in treating back pain	6	Ostelo 2003	Item considered relevant by the authors	Houben et al 2005b PABS Watson 2008 Bowey-Morris 2010 Fullen 2011 Morris/ Watson 2011
		A patient suffering from severe back pain will benefit from physical exercise	6	Ostelo 2003	TSK	Houben et al 2005b PABS Bishop et al 2008 Overmeer 2009 PABS Vonk 2009 Derghazarian/Simmonds 2011
		Exercises that may be back straining should not be avoided during the treatment	1	Houben et al 2005b	Item considered relevant by the authors	

Ability to/necessity for (precise) diagnosis	Importance of diagnosis to appropriate treatment	Appropriate therapy for most low back pain requires a precise diagnosis	1	Cherkin et al 1988	derived through discussion with physicians and chiropractors	
		Knowledge of the tissue damage is not necessary for effective therapy	2	Ostelo 2003	Item considered relevant by the authors	Houben et al 2005b PABS
	Value of X-ray/imaging/diagnostic tests	X-ray films are rarely useful in the assessment of low back pain	1	Cherkin et al 1988	derived through discussion with physicians and chiropractors	
		X-ray pictures of the lumbar spine are useful in the investigation of acute (4 month) low back pain	1	Chaudhary 2004	Based on the RCGP clinical guidelines and back book	
		X-ray, CT and MRI are useful in finding the cause of back pain.	2	Werner et al 2005	Statement based on messages derived from Norwegian guidelines for LBP	Werner et al 2008
		In back pain, imaging tests are unnecessary	1	Houben et al 2005b	Item considered relevant by the authors	
Clinicians' perceptions of what patients think (various topics)	N/A	*(When arthritics think about arthritis, they usually think of….)* What things can patients do to help their arthritis?	1	Lorig et al 1984	Through discussion with patients and physicians	
		(When arthritics think about arthritis, they usually think of….) What things that patients do make their arthritis worse?	1	Lorig et al 1984	Through discussion with patients and physicians	

		(When arthritics think about arthritis, they usually think of….) What things do patients *think* they can do to help their arthritis?	1	Lorig et al 1984	Through discussion with patients and physicians	
		(When arthritics think about arthritis, they usually think of….) What things to patients *think* make their arthritis worse?	1	Lorig et al 1984	Through discussion with patients and physicians	
		I'm afraid that I might injure myself if I exercise	1	Sieben 2009	TSK	
		People aren't taking my medical condition seriously enough	1	Sieben 2009	TSK	
		I am afraid that I might injure myself accidentally	1	Sieben 2009	TSK	
Perceived value and use of condition specific guidelines/clinical tools	N/A	Practice guidelines would be useful to help physical therapists in the management of clinical conditions	1	Li and Bombardier 2001	Derived from a questionnaire about beliefs regarding treatment of LBP	
		I find practice guidelines helpful in the management of LBP	1	Li and Bombardier 2001	Derived from a questionnaire about beliefs regarding treatment of LBP	
		I am familiar with The Back Book (an evidenced-based patient booklet from HMSO)	1	Chaudary 2004	Based on the RCGP clinical guidelines and back book	

		I regularly give *The* Back *Book* to my patients with mechanical back pain	1	Chaudary 2004	Based on the RCGP clinical guidelines and back book	
UNALLOCATED ITEMS		Many Ix for my patients are ordered to conform with normal practice patterns of my peer group	1	Chaudary 2004	Based on the RCGP clinical guidelines and back book	
		Chronic back pain patients should have the same benefits as the handicapped because of their chronic pain problem	5	Houben et al 2005b	Item considered relevant by the authors	Overmeer 2009 HC-PAIRS Evans 2010 Chen 2011 HC-PAIRS Slater 2012
		Chronic back pain patients have to accept that they are disabled persons, due to their chronic pain	5	Houben et al 2005b	Item considered relevant by the authors	Overmeer 2009 HC-PAIRS Evans 2010 Chen 2011 HC-PAIRS Slater 2012
		Even though their pain is always there, chronic pain patients often don't notice it at all when they are keeping themselves busy	5	Houben et al 2005b	Item considered relevant by the authors	Overmeer 2009 HC-PAIRS Evans 2010 Chen 2011 HC-PAIRS Slater 2012

Notes: N/A=not applicable; BBQ=Back Beliefs Questionnaire; TSK=Tampa Scale for Kinesiophobia; ABS=Attitudes to Back Pain Scale for musculoskeletal practitioner; FABQ=Fear Avoidance Beliefs Questionnaire; HCP13=13 item version of Health Care Providers' Pain and Impairment Relationship Scale; HCP13=13 item version of the Health Care Providers' Pain and Impairment Relationship Scale; HCP15=15 item version of the Health Care Providers' Pain and Impairment Relationship Scale; PABS=Pain Attitudes and Beliefs Scale; LBP=Low back pain; RCGP=Royal College of General Practitioners; WCB=Workers' compensation board; RTW=Return to work

Appendix 6 - Ethical approval letters

Concept mapping ethics approval

On 19 September 2012 09:12, Elizabeth Cameron <e.j.cameron@keele.ac.uk>wrote:

Dear Kirsty,

I am pleased to inform you that your study has now been approved.

On behalf of the Chair, Jackie Waterfield I would like to thank you for the comprehensive explanation of the 'seeding statement' and for the clarity of the resubmitted documents.

We wish you all the best with your study.

Best wishes,

Elizabeth

Elizabeth Cameron
ERP1 Administrator
Faculty of Humanities and Social Sciences Research Office
Claus Moser CM0.18
Keele University
Keele
Staffordshire
ST5 5BG
Tel: +44(0)1782 734256
Fax: +44(0)1782 734592
Email: e.j.cameron@humss.keele.ac.uk

DABS ethics

Keele University

RESEARCH AND ENTERPRISE SERVICES

9th October 2013

Kirsty Duncan
Institute for Primary Care and Health Sciences
Keele University

Dear Kirsty,

Re: The DABS Study Developing a musculoskeletal attitudes and beliefs scale

Thank you for submitting your revised application for review.

I am pleased to inform you that your application has been approved by the Ethics Review Panel.

The following documents have been reviewed and approved by the panel as follows:

Document	Version	Date
Summary of Proposal	1	13th August 2013
Letters of Invitation and Reminders		
- Initial Invitation Letter	2	30th September 2013
- Reminder Postcard 1	2	30th September 2013
- Reminder Invitation Letter 1	2	30th September 2013
- Retest Invitation Letter	2	30th September 2013
- Reminder Invitation Letter 2	2	30th September 2013
- Reminder Postcard 2	1	13th August 2013
Information Sheets		
- Participant Information Sheet 1	2	30th September 2013
- Participant Information Sheet 2	2	30th September 2013
Consent Form	2	30th September 2013
Questionnaires		
- Questionnaire 1	2	30th September 2013
- Retest Questionnaire	2	30th September 2013

If the fieldwork goes beyond the date stated in your application 31st January 2014, you must notify the Ethical Review Panel via the ERP administrator at uso.erps@keele.ac.uk stating ERP2 in the subject line of the e-mail.

If there are any other amendments to your study you must submit an 'application to amend study' form to the ERP administrator stating ERP2 in the subject line of the e-mail. This form is available via http://www.keele.ac.uk/researchsupport/researchethics/

If you have any queries, please do not hesitate to contact me via the ERP administrator on uso.erps@keele.ac.uk stating ERP2 in the subject line of the e-mail.

Yours sincerely

Dr Bernadette Bartlam Chair – Ethical Review Panel

CC RI Manager
Supervisor

Research and Enterprise Services, Keele University, Staffordshire, ST5 5BG, UK
Telephone: + 44 (0)1782 734466 Fax: + 44 (0)1782 733740

DABS NHS assurance

NHS Assurance Letter - DABS study (CSP 138326).pdf

The Development of a Concept Map of the Biopsychosocial Approach to Musculoskeletal Pain

Consent Form

Name and contact details of researcher:
Kirsty Duncan
Arthritis Research UK Primary Care Centre
Keele University
Staffordshire, ST5 5BG

k.duncan@keele.ac.uk
Tel. 00 44 (0)1782 734015

Please initial box if you agree with the statement

1.	I confirm that I have read and understand the information sheet (version no. 1.1, 18.09.12) for the above study and have had the opportunity to ask questions	☐
2.	I understand that my participation is voluntary and that I am free to withdraw at any time	☐
3.	I understand that data collected about me during this study will be anonymised before it is submitted for publication	☐
4.	I agree to maintain the confidentiality of the other participants in this study	☐
5.	I agree to take part in this study	☐

Please sign and date below:

Name of Participant	**Date**	**Signature**
Name of Researcher	**Date**	**Signature**

Participant ID number:

Arthritis Research UK Primary Care Centre
Institute for Primary Care and Health Sciences
Keele University
Staffordshire
ST5 5BG

24th September 2012

Dear Colleague,

We would like to invite you to participate in a Concept Mapping workshop at the Arthritis Research UK Primary Care Centre on Thursday 27th September at 11.00 in room 0.79.

This workshop is part of a Doctoral project being undertaken by Kirsty Duncan within the Arthritis Research UK Primary Care Centre, Keele University, under the supervision of Dr. Annette Bishop and Professor Nadine Foster.

Concept mapping is a structured group process which we are using to create a conceptual framework for the biopsychosocial approach to musculoskeletal clinical practice. This framework will then be used to inform the re-development of a measure of healthcare practitioners' attitudes and beliefs. Further details about the workshop, the Concept Mapping method and the project are enclosed with this letter.

You have been selected personally to participate because we hope that your interest and expertise in the management of common musculoskeletal problems will allow you to contribute a valuable clinical and/or research perspective to the workshop.

If you have any questions about this study or would like to participate in the workshop, please do not hesitate to contact Kirsty Duncan at the address below.

Yours sincerely,

Kirsty Duncan, Dr. Annette Bishop and Professor Nadine Foster

e-mail: k.duncan@keele.ac.uk tel: 01782 734015

Enc.: Study proposal and Participant Information Sheet

Keele University

The Development of a Concept Map of the Biopsychosocial Approach to Musculoskeletal Pain

Participant Information Sheet (local)

Thank you for your interest in this Concept Mapping workshop which is part of a Doctoral project being undertaken by Kirsty Duncan within the Arthritis Research UK Primary Care Centre, Keele University, under the supervision of Dr. Annette Bishop and Professor Nadine Foster. You have been asked to participate in this Concept Mapping workshop because we hope that your interest and expertise in the management of common musculoskeletal problems will allow you to contribute a valuable clinical and/or research perspective to the workshop.

This leaflet explains the Concept Mapping process used in this study. Please read the following information and do not hesitate to ask if there is anything that is unclear or if you would like more information.

What is the purpose of the study?

The purpose of this study is to generate a conceptual framework of the biopsychosocial approach to common musculoskeletal (MSK) pain. This framework will then be utilised to generate new items for a measure of healthcare professionals' attitudes and beliefs about common MSK pain, which aims to provide comprehensive construct representation of a biopsychosocial treatment orientation to common MSK problems.

What is involved if I agree to take part?

Concept Mapping is a multi-stage, structured group process where participants work both individually and as a group. The approach incorporates qualitative and quantitative methods to rapidly develop group consensus on a complex phenomenon[1].

During the workshop, you will generate ideas, or statements in response to a 'seeding statement' which will be provided prior to the workshop. The group's ideas will then be collected using a facilitated nominal group technique. Following the workshop, you will be e-mailed and invited to 'sort' the statements produced during the workshop. Your statement sort will then be combined with those of the rest of the group to produce a

[1] Kane M, Trochim WMK 2007 Concept Mapping for Planning and Evaluation. Sage Publications, London

visual representation, or 'map', of the group's conceptualisation of the biopsychosocial approach to MSK pain. This is achieved through multi-dimensional scaling and cluster analysis.

Participants will then be provided with this map and invited to contribute to its interpretation in a follow-up workshop.

Do I have to take part?

No. Your involvement in the workshop and each of the subsequent stages is voluntary. You are free to withdraw from the study at any time and without giving reasons.

If you do decide to take part you will be asked to provide some demographic information (to allow group participants to be described in terms of profession and experience) and signed consent.

Will my participation in the study be kept confidential?

The statements that you contribute will be completely anonymous outside of the workshop and the statement sort will also be analysed anonymously. Demographic data forms will have identifying information removed and will subsequently be stored in a locked filing cabinet until the concept mapping process has been completed, when they will be destroyed. All other data (statements generated, sort information) will be anonymised and stored in password protected folders on secure drives and accessed only by members of the study team. Data will be stored in line with the research centre's data storage policy.

What will happen to the results of this study?

The map produced from this workshop will be combined with that from other workshops on the same topic and used to inform a conceptual framework from which to generate new items for a measure of healthcare practitioners' attitudes and beliefs, as described above. The results of the study will be disseminated through publication and presentation at conferences. This study is part of a Doctoral programme of work being undertaken by Kirsty Duncan with the support of Dr. Annette Bishop and Professor Nadine Foster of Keele University, UK.

Who is funding this research?

This study is supported by a Keele University ACORN Doctoral Award.

Who has reviewed this study?

This study has received ethical approval from Keele University's Ethical Review Panel.

What are the risks and benefits of participation?

Your participation will make a valuable contribution to creating a more complete conceptualisation of the biopsychosocial treatment orientation to MSK problems. This will in turn be used to re-develop a measure of healthcare practitioners' attitude which has utility in clinical, teaching and research settings. Your participation will also support the completion of this Doctoral project.

There are no known risks to participation in this study. However, if you have a question or concern about any aspect of the study, you may wish to speak to the researcher(s) who will do their best to answer your questions. You should contact Kirsty Duncan at the address below. You can also contact the project supervisor, Dr. Annette Bishop on a.bishop@keele.ac.uk or 01782 734838.

If you remain unhappy about the research and/or wish to raise a complaint about any aspect of the way that you have been approached or treated during the course of the study please write to Nicola Leighton who is the University's contact for complaints regarding research at the following address:-

Nicola Leighton, Research Governance Officer, Research & Enterprise Services, Dorothy Hodgkin Building,

Keele University, ST5 5BG

E-mail: n.leighton@uso.keele.ac.uk

Tel: 01782 733306

Thank you very much for taking the time to read this leaflet.

If you have any queries you can contact Kirsty Duncan at:

Tel: +00 44 (0)1782 734015 or e-mail: k.duncan@keele.ac.uk

The Development of a Concept Map of the Biopsychosocial Approach to Musculoskeletal Pain

Participant Information Sheet (Odense)

Thank you for your interest in this Concept Mapping workshop which is part of a Doctoral project being undertaken by Kirsty Duncan within the Arthritis Research UK Primary Care Centre, Keele University, under the supervision of Dr. Annette Bishop and Professor Nadine Foster. You have been asked to participate in this Concept Mapping workshop because we hope that your interest and expertise in the management of common musculoskeletal problems will allow you to contribute a valuable clinical and/or research perspective to the workshop.

This leaflet explains the Concept Mapping process used in this study. Please read the following information and do not hesitate to ask if there is anything that is unclear or if you would like more information.

What is the purpose of the study?

The purpose of this study is to generate a conceptual framework of the biopsychosocial approach to common musculoskeletal (MSK) pain. This framework will then be utilised to generate new items for a measure of healthcare professionals' attitudes and beliefs about common MSK pain, which aims to provide comprehensive construct representation of a biopsychosocial treatment orientation to common MSK problems.

What is involved if I agree to take part?

Concept Mapping is a multi-stage, structured group process where participants work both individually and as a group. The approach incorporates qualitative and quantitative methods to rapidly develop group consensus on a complex phenomenon[2].

During the workshop, you will generate ideas, or statements in response to a 'seeding statement' which will be provided prior to the workshop. The group's ideas will then be collected using a facilitated nominal group technique. Following the workshop, you will be e-mailed and invited to 'sort' the statements produced during the workshop. Your statement sort will then be combined with those of the rest of the group to produce a visual representation, or 'map', of the group's conceptualisation of the biopsychosocial approach to MSK pain. This is achieved through multi-dimensional scaling and cluster analysis.

[2] Kane M, Trochim WMK 2007 Concept Mapping for Planning and Evaluation. Sage Publications, London

Participants will then be provided with this map and invited to contribute to its interpretation – this will be conducted by e-conference, although for those unable to participate in this an alternative way of contributing will be arranged.

Do I have to take part?

No. Your involvement in the workshop and each of the subsequent stages is voluntary. You are free to withdraw from the study at any time and without giving reasons.

If you do decide to take part you will be asked to provide some demographic information (to allow group participants to be described in terms of profession and experience) and signed consent.

Will my participation in the study be kept confidential?

The statements that you contribute will be completely anonymous outside of the workshop and the statement sort will also be analysed anonymously. Demographic data forms will have identifying information removed and will subsequently be stored in a locked filing cabinet until the concept mapping process has been completed, when they will be destroyed. All other data (statements generated, sort information) will be anonymised and stored in password protected folders on secure drives and accessed only by members of the study team. Data will be stored In line with the research centre's data storage policy.

What will happen to the results of this study?

The map produced from this workshop will be combined with that from other workshops on the same topic and used to inform a conceptual framework from which to generate new items for a measure of healthcare practitioners' attitudes and beliefs, as described above. The results of the study will be disseminated through publication and presentation at conferences. This study is part of a Doctoral programme of work being undertaken by Kirsty Duncan with the support of Dr. Annette Bishop and Professor Nadine Foster of Keele University, UK.

Who is funding this research?

This study is supported by a Keele University ACORN Doctoral Award.

Who has reviewed this study?

This study has received ethical approval from Keele University's Ethical Review Panel

What are the risks and benefits of participation?

Your participation will make a valuable contribution to creating a more complete conceptualisation of the biopsychosocial treatment orientation to MSK problems. This will in turn be used to re-develop a measure of healthcare practitioners' attitude which has utility in clinical, teaching and research settings. Your participation will also support the completion of this Doctoral project.

There are no known risks to participation in this study. However, if you have a question or concern about any aspect of the study, you may wish to speak to the researcher(s) who will do their best to answer your questions. You should contact Kirsty Duncan at the address below. You can also contact the project supervisor, Dr. Annette Bishop on a.bishop@keele.ac.uk or 01782 734838.

If you remain unhappy about the research and/or wish to raise a complaint about any aspect of the way that you have been approached or treated during the course of the study please write to Nicola Leighton who is the University's contact for complaints regarding research at the following address:-

Nicola Leighton, Research Governance Officer, Research & Enterprise Services, Dorothy Hodgkin Building,

Keele University, ST5 5BG

E-mail: n.leighton@uso.keele.ac.uk

Tel: 01782 733306

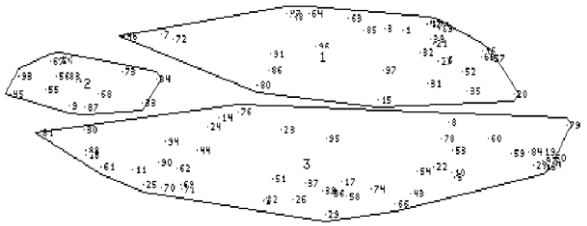
Thank you very much for taking the time to read this leaflet.

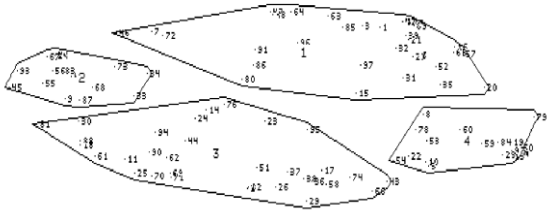
If you have any queries you can contact Kirsty Duncan at:

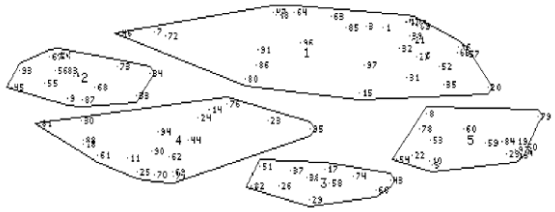
Tel: +00 44 (0)1782 734015 or e-mail: k.duncan@keele.ac.uk

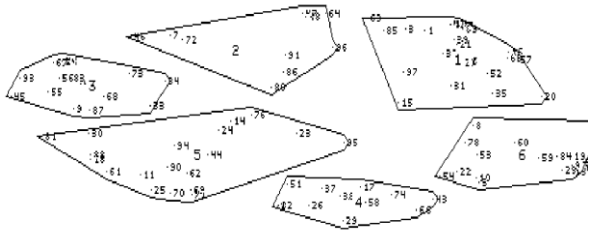
Appendix 8 - Maps

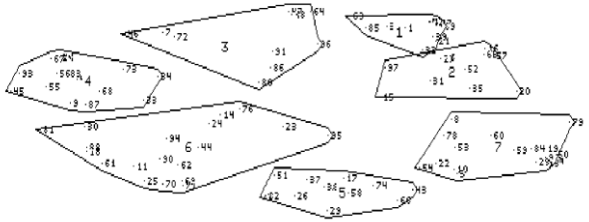
International group

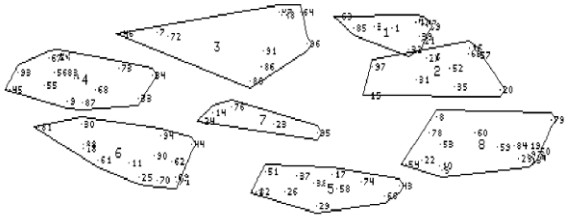


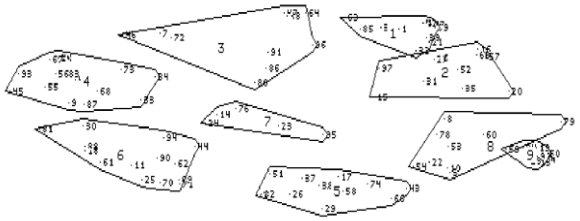


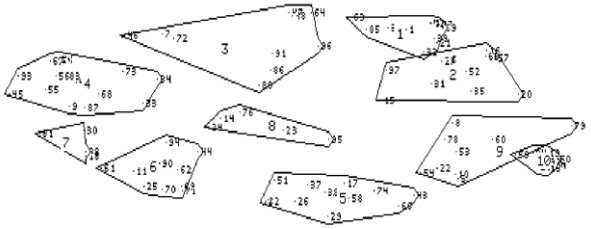


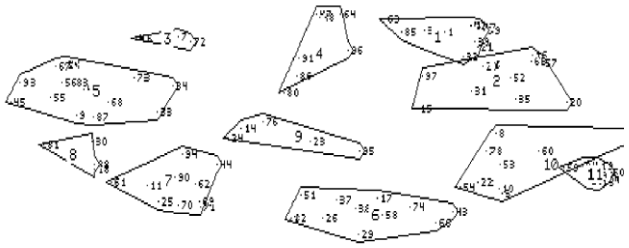


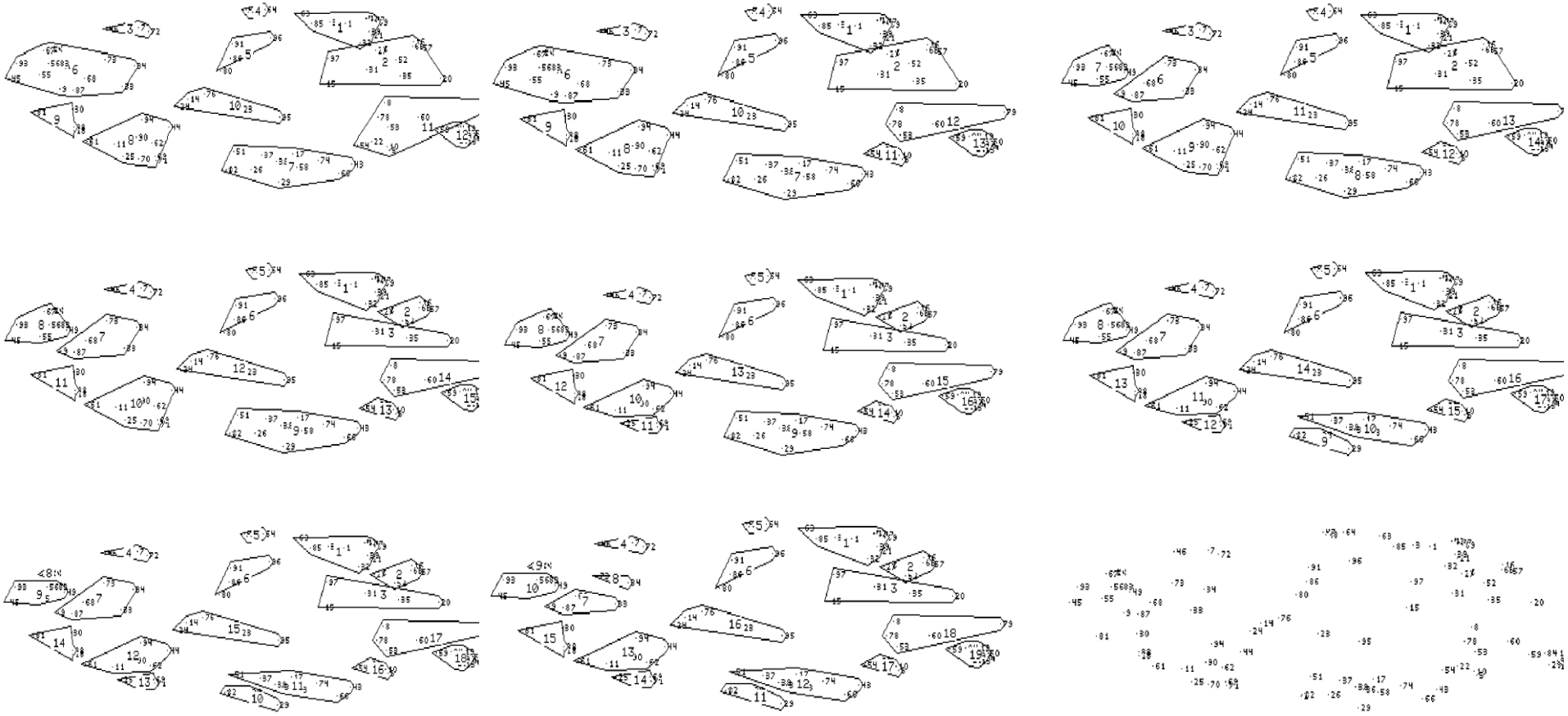




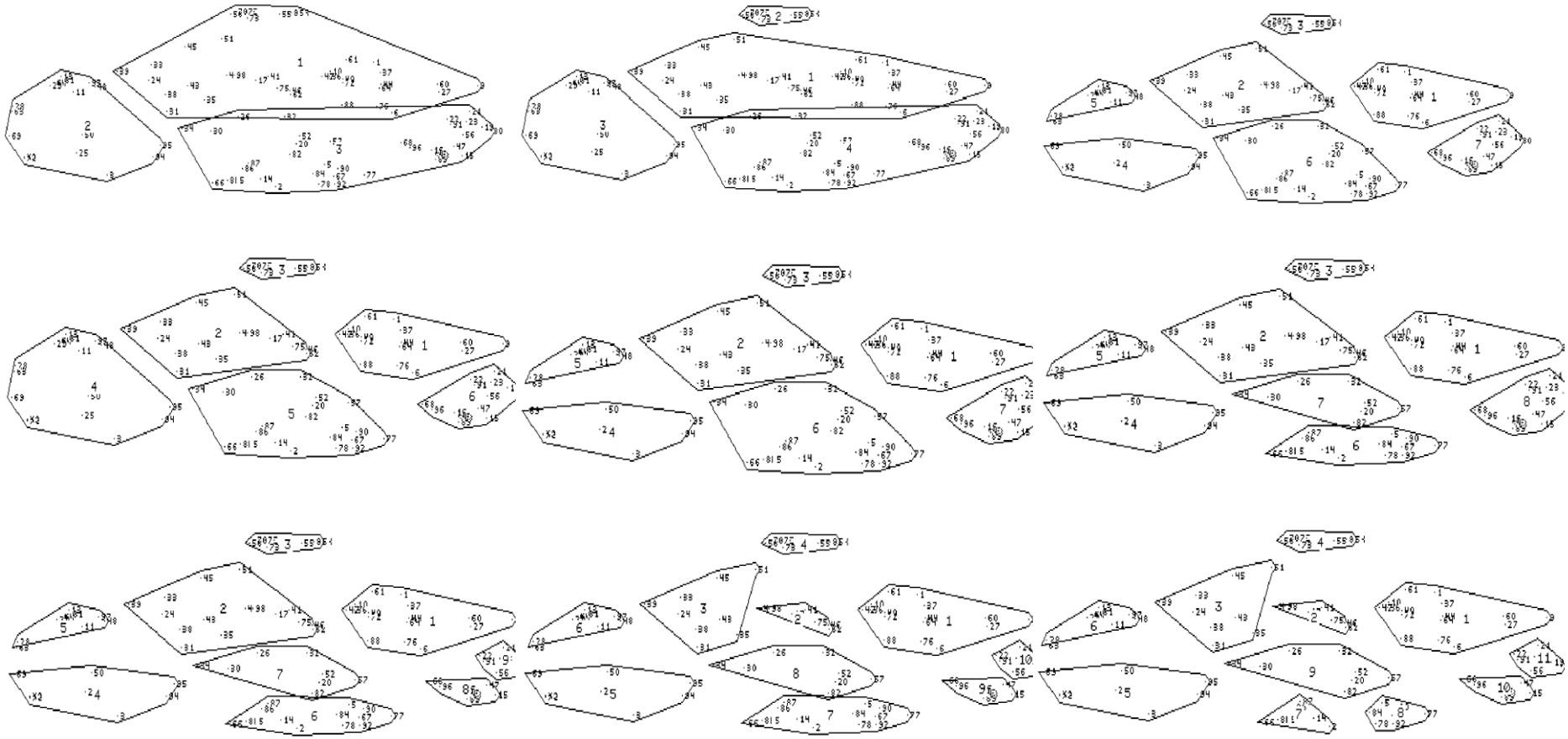


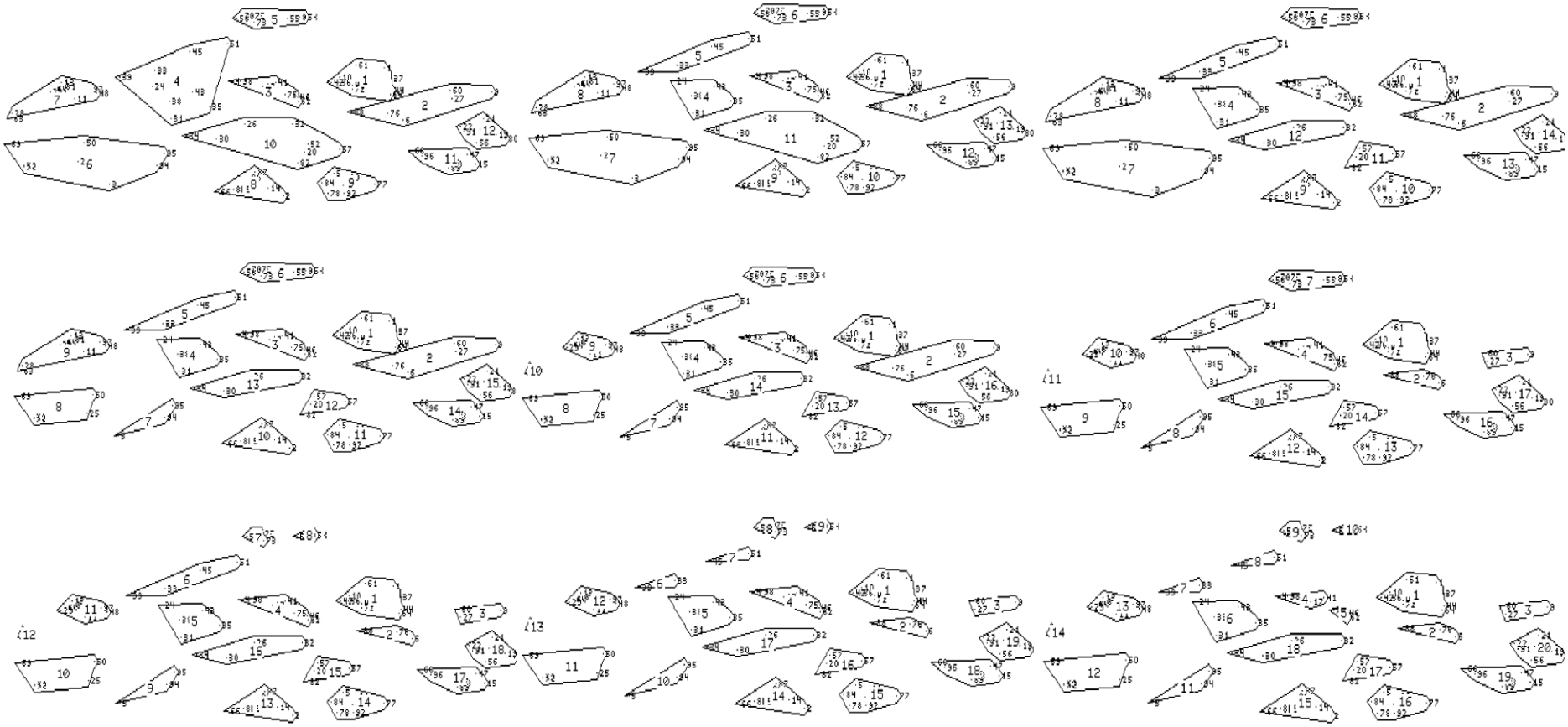


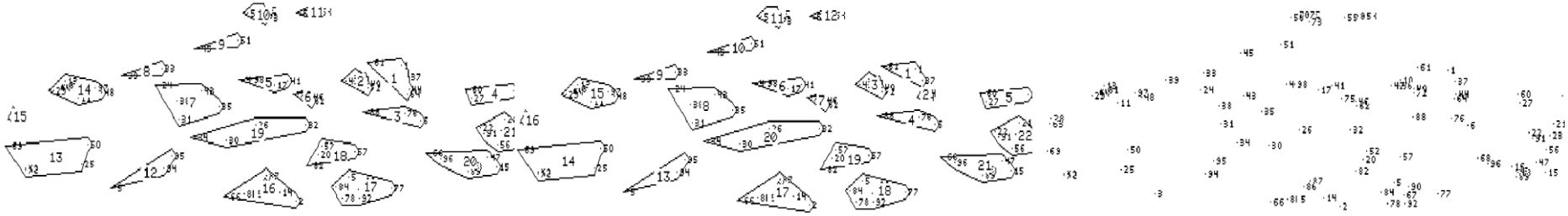




Keele group







Appendix 9 - Final cluster lists a) international group b) local group

a) International group – interpreted cluster list

Cluster no. and assigned name *(relocated statements)*	State-ment no. (*x/y**)	Statement	Median statement rating	Median cluster rating
Cluster 1 ***(77,89,21→2, 63→5)*** **Beliefs**	1	A patient's sense of control over their pain problem	4	4
	3	Fear of movement	4	
	85	A patient's current way of coping	4	
	4	A patient's beliefs regarding the cause of their musculoskeletal problem	4	
	42	A patient's perception of the importance of their symptoms	4	
	39	A patient's understanding of their pathology	4	
	32	A patient's treatment preferences	4	
Cluster 2 ***(27→6"emotional state")*** **Expectations**	6	A patient's expectations with regard to treatment	4	4
	52	The treatment goals of the patient	4	
	16	A patient's readiness for behavioural change	3	
	57	A patient's motivation to take responsibility for their therapy	4	
	65	Considering the patient's perception of the clinical profession, their expertise and seniority	4	
	78/15	*The specific reasons why a patient came to see them*	*3*	
	77/1	A patient's hopes for recovery	*3.5*	
	89/1	A patient's motivation for improvement	*4*	
	21/1	A patient's expectations with regard to outcome	*4*	
Cluster 3 ***(97→6"emotional state", 20→16, 31→7)*** **Understanding**	15	A patient's educational level	3	4
	35	A patient's ability to understand information about their problem	4	
	60/15	*The range and power of the different explanations and recommendations that the patient may have received*	*4*	
Cluster 4 ***(46→8)*** **Social relationships/support**	7	How a patient's family views the 'seriousness' of the condition	3	3
	72	The impact of a patient's social relationships on their pain experience and responses to it	3	
	49/8	*The impact of a patient's pain problem on their social relationships, including family*	*3*	
	56/8	*A patient's social support network*	*4*	
	83/8	*That the presence of a family member, colleague or the clinician might change a patient's behaviour*	*3*	

	8/15	*Whether a patient's problem is considered legitimate*	*2*	
Cluster 5 **Work beliefs**	47	A patient's perception of the link between their job and their symptoms	4	4
	48	A patient's perception of their ability to continue in work	4	
	64	A patient's perception of the physical demands of their job	4	
	63/1	*A patient's perception of their future ability to work*	*4*	
(New) Cluster 6 ***(80, 86, 91→12,)*** **Emotional state**	96	A patient's mood	3	3
	27/2	*The influence of a patient's emotional state*	*3*	
	97/3	*A patient's depression and/or anxiety*	*3*	
Cluster 7 **Life circum-stances**	9	A patient's health lifestyle (e.g. sedentary versus active, stress, diet, smoking, addictions)	3	3
	87	A patient's related financial situation	3	
	33	A patient's access to treatment (financial and physical)	3	
	68	The family history	3	
	34	The impact of a patient's physical environment on their ability to engage in self-management	3.5	
	73	A patient's religious, cultural, ethnic background	3	
	31/3	*An awareness of a patient's significant life events*	*3*	
	55/8	*A patient's socioeconomic context*	*4*	
	30/12	*Community-based opportunities for self-management*	*4*	
Cluster 8 ***(55→7, 49, 56, 83 →4)*** **Work**	12	A patient's workplace environment	4	4
	75	Barriers to return to work	4	
	67	A patient's relationship with co-workers or supervisors	3	
	45	The effects of the pain on work and work on pain	4	
	93	A patient's job	3	
	46/4	*The impact of a patient's pain problem on their ability to remain in/return to work*	*4*	
Cluster 9 **HCP knowledge/ skills, clinical exam**	2	How best to obtain a physical cause (distinct from clinical diagnosis)	3	4
	82	Exploring signs and symptoms for serious conditions	5	
	26	The value of diagnostic tests	4	
	29	Developing clinical competencies to deliver a biopsychosocial approach	4	
	17	Recurrence prevention	4	
	74	That diagnostic imaging is *not* always relevant	4	

	36	Conducting a thorough clinical examination of the patient	4	
	38	Obtaining appropriate imaging of the painful or relevant body region	2	
	58	Understanding that there are many different therapeutic methods that can be used and the importance of choosing the one(s) that are most likely to work with an individual patient	5	
	37	Reliably determining the presence or absence of centralisation and directional preference	2.5	
	51	The fact that pain is multi-factorial	4	
	43	Judging the relative importance of the 'bio', the 'psycho' and the 'social' components for each individual patient	5	
	66	Non-specific treatment effects (e.g. rapport, trust, compassion, empathy, therapeutic relationship)	4	
	95/9	*An acceptable medication regime*	*2*	
	5/14	*Providing evidence-based information and treatment options*	*4*	
Cluster 10 **Bio-aspects**	11	The stage of healing	4	3
	61	The patient's functional anatomy	2	
	62	Any pathology	3.5	
	90	The duration of symptoms	4	
	44	A patient's previous history of pain	3	
	94	How a patient's treatment is funded	3	
Cluster 11 **Pain theory/ mechanisms**	25	The risks and costs of treatment options	4	4
	70	The fact that pain can be centrally generated and maintained	4	
	69	Emerging neuroscience knowledge	3	
	71	Current pain theory and mechanisms	4	
Cluster 12 ***(30→7)*** **Physical function**	18	A patient's level of physical impairment	4	3.5
	88	The patient's level of pain and limitation in activity of daily living	4.5	
	81	A patient's level of physical activity	4	
	80/6	*A patient's ability to wash and dress themselves*	*3*	
	86/6	*A patient's ability to engage in a desired level of sexual activity*	*2*	
	91/6	*A patient's awareness of how they use their body*	*3*	
Cluster 13 ***(95→9)*** **Co-morbidities**	14	Co-morbidities (mental and physical health)	3	3.5
	24	A patient's habitual behaviours	3	
	76	The presence and impact of other musculoskeletal pain problems	4	
	23	A patient's response to previous treatment	4	
CLUSTERS 14 and 15 'DISBANDED'				
Cluster 16	13	Appropriate patient reassurance	4	4
	28	Engaging the patient in the treatment plan	3	
	40	Meeting the information needs of the patient	4	

The patient-practitioner encounter	41	Taking the time to provide an explanation to the patient	5	
	92	Ensuring that information provided has been understood correctly	4	
	50	Helping the patient share responsibility for their treatment and outcome	4	
	19	Informed, shared decision making with patients to identify treatment options	4	
	84	Listening to the patient better and talking less	4	
	59	Identifying the educational needs of the patient	4	
	20/3	*Eliciting patient's beliefs and expectations*	*4*	
	10/14	*Individualised care*	*4*	
	22/14	*Setting specific goals for improvement*	*4*	
	53/15	*The patient's perspective, the clinician's perspective and the importance of managing any potential discordance or mismatch between the two*	*4*	
	79/15	*Reducing a patients' fears*	*5*	

**Statement relocated from a different cluster during interpretation*

54/14 REMOVED DURING GROUP INTERPRETATION	*A clinician's awareness of their own limitations and recognition of when to discharge a patient or refer them on*	*4*

b) Local group - interpreted cluster list

Cluster no. and assigned name *(relocated statements)*	**State-ment no. (*x/y**)**	**Statement**	**Median statement rating**	**Median cluster rating**
Cluster 1	1	The importance of the patient's thoughts, attitudes and feelings on their pain experience	5	4
Patient perceptions	61	What the patient thinks the future holds	4	
	37	The patient's preferences about treatments	3	
	44	Any psychological barriers to treatment	4	
	64	The patient's level of motivation to engage in treatment	5	
	10	The roles and activities that are important to the patient	4	
	36	The effect of the patient's behaviour on their pain	4	
	42	The patient's skills in self-management	4	
	40	The patient's confidence in their ability to self-manage	4.5	
	72	The expectations of the patient about treatment	4	
	62/3	*Patients knowledge and understanding of the problem*	*4*	
	25/6	*The patient's ability to appropriately navigate healthcare services*	*2.5*	
	26/10	*The patient's ability to understand information about their pain problem*	*4*	
Cluster 2	6	Understanding the patient's beliefs about the cause of their problem	5	4
	76	Acknowledgement of how the patient chooses to deal with pain	3.5	

(merged with 12, 88 →"pt. behaviours")	9	A clinician's own influence on the patient's beliefs and behaviour towards work	4	
	27	That patients may find it difficult to accept that there are psychosocial influences on their pain	3.5	
Therapeutic relationship	60	The attitudes and beliefs of the patient about the healthcare profession	3	
	95/6	*Facilitating engagement with an individualised exercise/activity plan*	*4*	
	47/11	*The effect of healthcare practitioners' own beliefs and attitudes towards the patient*	*4*	
	80/12	*The values of both the patient and the practitioner*	*3*	
	56/12	*The importance of the relationship between the healthcare provider and the patient*	*4*	
	21/12	*The patient and practitioner having a shared understanding of the purpose of treatment*	*4.5*	
	22/12	*Understanding the goals of the patient*	*5*	
	91/12	*The need to have a clear understanding of the specific goals of treatment (e.g. reduce pain, increase meaningful function)*	*4.5*	
	23/12	*That treatment goals are realistic and agreed between the patient and the practitioner*	*5*	
Cluster 3	17	The outcome of previous treatments	4	4
	46	Whether the patient has previously had conflicting advice from healthcare practitioners	4	
(4→"mood", 98→on own, 41→"pt. behaviours, 62→1)	75	The impact of a patient's previous experience of pain on their beliefs and expectations	4	
	31/4	*How long the patient has experienced pain*	*3*	
Previous experiences				
CLUSTER 4 'DISBANDED'				
Cluster 5	7	The patient's work situation	4	4
	54	The impact of the patient's work on their problem	4	
Work	59	The demands of the patient's work	3	
	58	The attitudes and beliefs of the patient's employer	3.5	
	70	Support from the patient's employer	3	
	73	Whether the patient is off work because of their pain problem	4	
	8	The patient's perceptions of the impact of their work on their problem	4	
	53	The patient's attitude toward work	4	
	74	Whether the patient expects to get back to work	4	
	79	A patient's perceived barriers to work	4	
	55	Early return to work	4	
Cluster 6	3	Organisational understanding for and support for a biopsychosocial approach	3	3
	50	Awareness of local facilities to support healthy lifestyle choices	3	
(94→9, 95→2/12, 25→1)	49	The availability of local health services	3	
	71	Local rationing of healthcare services	2	
Availability of resources	69	The wider public health needs of the local population	2	

Cluster 7 **Social influences at an individual level**	11	Awareness of the support for the patient from family and friends	3	3
	48	The patient's level of participation in society (e.g. social activities, work, leisure)	3	
	97	The patient's religion, culture or ethnicity	3	
	12	Family and friend's effect on the patient's problem	4	
	65	The reaction of family and friends to the patient's problem	4	
	29	The impact of the patient's physical environment (home and wider community)	3	
	13	The effect of the patient's problem on their family and friends	3	
	81	Social isolation	3	
	28	(The importance of) social deprivation	3	
	63	The general societal view of the problem	2	
	24/4	*The demands of the patient's roles and responsibilities*	*4*	
	33/4	*The patient's ability to undertake their usual activities*	*4*	
	39/4	*The emotional benefits and losses to the patient (e.g. increased attention and support from family, loss of roles)*	*4*	
	45/4	*Whether there are financial implications for the patient*	*3*	
	51/4	*Knowledge of relevant financial benefits available to the patient*	*2*	
Cluster 8 **The complexity of pain**	2	A consistent shared understanding across all practitioners	3	3
	14	That pain is a private experience that is difficult to communicate	3	
	66	Using relevant outcome assessment tools	3	
	83	That the specific cause of pain is not always understood	4	
	85	(The fact that) There are many factors which contribute to the persistence of pain	4	
	86	(The fact that) There is not always a cure for pain	4	
	87	(The fact that) It is difficult to differentiate pain and suffering	3	
	82/10	*(The fact that) Pain is difficult to assess*	*3*	
Cluster 9 **Compre-hensive evidence-based treatment**	5	The importance of assessing biological, psychological and social factors	5	4
	90	Understanding when (further) 'biomedical' assessment and physical management is not appropriate	4.5	
	67	The use of best available evidence about effective treatment	4	
	84	The importance of offering patients an explanation of why pain persists	4	
	77	Appropriate training in the skills required to deliver biopsychosocial interventions/treatment	5	
	78	Awareness of the pathways for on-going referral (if necessary)	3.5	
	92	A good understanding of the contribution of other professionals and when to get them involved	4	

	94/6	*Understanding the role of exercise and activity*	*4*	
	68/11	*The importance of facilitating a patient's self-management*	*4*	
Cluster 10 ***(26→1, 82→8)*** **Biomedical assessment**	20	Underlying patho-anatomical components	3	3
	52	An appropriate objective examination which may include further investigations	4	
	57	Screening for signs of serious pathology	5	
	26	The patient's ability to understand information about their pain problem	4	
	32	What other symptoms the patient experiences (e.g. stiffness)	3	
	30	The nature and intensity of the patient's pain	3	
	34	The patient's general physical fitness	3	
	35/4	*The patient's current level of physical function*	*3.5*	
Cluster 11 ***(68→9, 47→2/12)*** **Commun-ication**	15	The lack of a common language (of pain) between patients and professionals	3	4
	16	The impact of specific language used to describe the pain problem	4	
	18	The importance of listening skills	5	
	93	That good communication skills are an important part of the effectiveness of any intervention	5	
	89	The importance of explaining the pain problem using language that the patient can understand	4.5	
	96	The importance of the patient feeling that the clinician believes their pain is real	4	
	19/12	*The patient's body language and non-verbal communication*	*4*	
CLUSTER 12 MERGED WITH 2				
New clusters				
Patient behaviours	*38/4*	*Whether the patient is making healthy lifestyle choices in their everyday life*	*3*	*4*
	41/3	*How the patient currently copes with their pain problem*	*4*	
	88/2	*Adherence with treatment*	*4*	
Mood **Single item**	*4/3*	*The emotional state of the patient*	*4*	*4*
	43/4	*The impact of co-existing anxiety and depression*	*4*	
	98/3	*Sleep deprivation*	*4*	

**Statement relocated from a different cluster during interpretation*

Appendix 10 - Complete framework

State-ment no.	Median import-ance rating	Selected as represent-tative by…	Statement	Chosen representative statement(s)	Tertiary domain	Secondary domain	Primary domain
r20	3	KD,NF	Underlying patho-anatomical components	Underlying patho-anatomical components	Patho-anatomy	Patient presentation	**BIO-CLINICAL**
g11	4	AB	The stage of healing				
g61	2		The patient's functional anatomy				
g62	3.5		Any pathology				
r32	3	KD,NF	What other symptoms the person experiences (e.g. stiffness)	The impact of other symptoms or health problems (re-word)	Co-morbidity		
g14	3	KD	Co-morbidities (mental and physical health)				
g76	4	KD,AB	The presence and impact of other musculoskeletal pain problems				
r30	3	KD	The nature and intensity of the patient's pain	The patient's current level of physical function A patient's level of physical activity The patient's level of pain	Pain and physical function		
r31	3		How long the patient has experienced pain				
r34	3	AB	The patient's general physical fitness				
r35	3.5	KD,NF,AB	The patient's current level of physical function				
g18	4	AB	A patient's level of physical impairment				
g80	3		A patient's ability to wash and dress themselves				
g81	4	NF,AB	A patient's level of physical activity				

g88	4.5	KD,NF	The patient's level of pain and limitation in activity of daily living				
g86	2		A patient's ability to engage in a desired level of sexual activity				
g90	4		The duration of symptoms				
r52	4	KD, NF, AB	An appropriate objective examination which may include further investigations	The use of appropriate diagnostic tests and investigations (re-word of g38/g26, r52)	Examination and appropriate use of tests/imaging	Assessment and management	
g2	3		How best to obtain a physical cause (distinct from clinical diagnosis)				
g26	4	NF, AB	The value of diagnostic tests				
g36	4	AB	Conducting a thorough clinical examination of the patient				
g37	2.5		Reliably determining the presence or absence of centralisation and directional preference				
g38	2	NF, AB	Obtaining appropriate imaging of the painful or relevant body region				
r57	5	KD, NF	Screening for signs of serious pathology	Identifying signs and symptoms that indicate serious pathology (re-word of g82)	Exclusion of serious pathology		
g82	5	NF	Exploring signs and symptoms for serious conditions				
r5	5	NF	The importance of assessing biological, psychological and social factors	The importance of assessing biological, psychological and social factors	Importance of bio, psycho and social elements		
g43	5	KD,AB	Judging the relative importance of the 'bio', the 'psycho' and the 'social' components for each individual patient				
r68	4	NF	The importance of facilitating a patient's self-management	Facilitating a patient to better manage and prevent recurrences (re-word)	Self-management and secondary prevention		
r94	4		Understanding the role of exercise and activity				
g17	4	NF	Recurrence prevention				

r78	3.5		Awareness of pathways for ongoing referral (if necessary)		Pathways of care		
r92	4		A good understanding of the contribution of other professionals and when to get them involved				
r14	3	AB	That pain is a private experience that is difficult to communicate	The fact that pain is multi-factorial	Multi-factorial nature of pain	Clinician understanding of pain mechanisms	
r83	4	KD,AB	That the specific cause of pain is not always understood				
r85	4	KD,AB	(The fact that) There are many factors which contribute to the persistence of pain				
r86	4		(The fact that) There is not always a cure for pain				
r87	3		(The fact that) It is difficult to differentiate pain and suffering				
g51	4	KD, NF	The fact that pain is multi-factorial				
g70	4		The fact that pain can be centrally generated and maintained				
r90	4.5	KD,AB	Understanding when (further) 'biomedical' assessment and physical management is not appropriate	Understanding when (further) 'biomedical' assessment and physical management is not appropriate	Limits of the biomedical approach		
g74	4		That diagnostic imaging is not always relevant				
g69	3		Emerging neuroscience knowledge		Pain theory		
g71	4		Current pain theory and mechanisms				
r67	4	KD, NF	The use of best available evidence about effective treatment	The use of best available evidence about effective treatment	Evidence-based practice	Evidence-based practice and training	
g5	4		Providing evidence-based information and treatment options				

r77	5	KD, NF, AB	Appropriate training in the skills required to deliver biopsychosocial interventions/treatment	Appropriate skills to deliver a biopsychosocial approach (re-word g29/r77)	Biopsychosocial skills and training		
g29	4	KD, NF, AB	Developing clinical competencies to deliver a biopsychosocial approach				
r2	3		A consistent shared understanding across all practitioners		UNPLACED IN BIO-CLINICAL		
r66	3		Using relevant outcome assessment tools				
g25	4		The risks and costs of treatment options				
g91	3		A patient's awareness of how they use their body				
g94	3		How a patient's treatment is funded				
g95	2		An acceptable medication regime				
r82	3		(The fact that) Pain is difficult to assess				
r1	5	AB	The importance of the patient's thoughts, attitudes and feelings on their pain experience	The importance of the patient's thoughts, attitudes and feelings on their pain experience What the patient expects the future holds (re-word) The expectations of the patient about treatment		Beliefs and expectations	**INDIVIDUAL PATIENT FACTORS**
r61	4	KD, NF, AB	What the patient thinks the future holds				
r72	4	KD, NF, AB	The expectations of the patient about treatment				
g3	4		Fear of movement				
g4	4	NF	A patient's beliefs regarding the cause of their musculoskeletal problem				
g6	4	KD,AB	A patient's expectations with regard to treatment				
g21	4	NF	A patient's expectations with regard to outcome				
g42	4		A patient's perception of the importance of their symptoms				

g77	3.5	KD	A patient's hopes for recovery				
g78	3	AB	The specific reasons why a patient came to see them				
r17	4		The outcome of previous treatments	Whether the patient has previously had conflicting advice from healthcare practitioners A patient's response to previous treatment		Previous experience	
r46	4	KD,NF	Whether the patient has previously had conflicting advice from healthcare practitioners				
r75	4		The impact of a patient's previous experience of pain on their beliefs and expectations				
g23 (moved from bio-clinical)	4		A patient's response to previous treatment				
g44 (moved from bio-clinical)	3		A patient's previous history of pain				
g60	4	KD	The range and power of the different explanations and recommendations that the patient may have received				
r26	4	KD,AB	The patient's ability to understand information about their pain problem	Patient's understanding of their pain problem (re-word of r26 and r62) A patient's ability to understand information about their problem		Understanding	
r62	4	KD, NF, AB	Patients knowledge and understanding of the problem				
g35	4	KD, NF, AB	A patient's ability to understand information about their problem				

g39	4	KD	A patient's understanding of their pathology				
r37	3	KD, NF, AB	The patient's preferences about treatments	The patient's preferences about treatments		Individual's treatment preferences and goals	
g32	4	KD,AB	A patient's treatment preferences				
g52	4		The treatment goals of the patient				
r36	4	NF	The effect of the patient's behaviour on their pain	How the patient currently copes with their pain problem A patient's confidence in their ability to control their pain problem (re-word)		Coping and behaviours	
r38	3		Whether the patient is making healthy lifestyle choices in their everyday life				
r40	4.5	KD, NF, AB	The patient's confidence in their ability to self-manage				
r41	4	KD,NF	How the patient currently copes with their pain problem				
r42	4		The patient's skills in self-management				
r88	4	AB	Adherence with treatment				
g1	4	KD, NF, AB	A patient's sense of control over their pain problem				
g9 (moved from social)	3		A patient's health lifestyle (e.g. sedentary versus active, stress, diet, smoking, addictions)				
g24 (moved from bio-clinical)	3		A patient's habitual behaviours				
g85	4	KD	A patient's current way of coping				

r64	5	KD,NF	The patient's level of motivation to engage in treatment	The patient's (level of) motivation to engage in treatment		Motivation/ readiness	
g16	3	KD	A patient's readiness for behavioural change				
g57	4	KD,AB	A patient's motivation to take responsibility for their therapy				
g89	4	KD	A patient's motivation for improvement				
r44	4	AB	Any psychological barriers to treatment		UNPLACED IN PATIENT/ INDIVIDUAL		
r25	2.5		The patient's ability to appropriately navigate healthcare services				
g15	3		A patient's educational level				
r4/3	4	NF	The emotional state of the patient	The emotional state of the patient The impact of co-existing anxiety and depression			**EMOTIONS**
r43	4	KD,NF	The impact of anxiety and depression				
g27	3	KD,AB	The influence of a patient's emotional state				
g96	3		A patient's mood				
g97	3		A patient's depression and/or anxiety				
g28	3	KD,NF	Engaging the patient in the treatment plan	Engaging the patient in the treatment plan		Patient engagement	**THERAPEUTIC RELATIONSHIP**
r95	4	KD	Facilitating engagement with an individualised exercise/activity plan				
g10	4		Individualised care				
r96	4		The importance of the patient feeling that the clinician believes their pain is real				

r93	5	NF,AB	That good communication skills are an important part of the effectiveness of any intervention	That good communication skills are an important part of the effectiveness of any intervention The importance of listening skills		Communication listening and language	
r18	5	KD,NF	The importance of listening skills				
g84	4	KD	Listening to the patient better and talking less				
r15	3	KD	The lack of a common language (of pain) between patients and professionals				
r16	4	KD	The impact of specific language used to describe the pain problem				
g13	4		Appropriate patient reassurance				
r19	4		The patient's body language and non-verbal communication				
g41	5	KD	Taking the time to provide an explanation to the patient	Taking the time to provide an explanation to the patient Meeting the information needs of the patient		Identifying and meeting patient information needs	
g40	4	KD,AB	Meeting the information needs of the patient				
r89	4.5	KD,NF	The importance of explaining the pain problem using language that the patient can understand				
g59	4	KD	Identifying the educational needs of the patient				
g92	4	KD	Ensuring that information provided has been understood correctly				
r84 (moved from bio-clinical)	4		The importance of offering patients an explanation of why pain persists				

r6	5	NF,AB	Understanding the patient's beliefs about the cause of their problem	Understanding the patient's beliefs about the cause of their problem	Eliciting and understanding patients' beliefs	Shared understanding and responsibility	
g20	4		Eliciting patient's beliefs and expectations				
r21	4.5	KD,AB	The patient and practitioner having a shared understanding of the purpose of treatment		Agreement about (purpose of) treatment		
g19	4		Informed, shared decision making with patients to identify treatment options				
r23	5	KD,NF	That treatment goals are (realistic and) agreed between the patient and the practitioner	That treatment goals are (realistic and) agreed between the patient and the practitioner	Goal setting		
r22	5	KD	Understanding the goals of the patient	The need to have a clear understanding of the specific goals of treatment			
r91	4.5	KD, NF (reword)	The need to have a clear understanding of the specific goals of treatment (e.g. reduce pain, increase meaningful function)				
g22	4	KD	Setting specific goals for improvement				
g58 (moved from bio-clinical)	5		Understanding that there are many different therapeutic methods that can be used and the importance of choosing the one(s) that are most likely to work with an individual patient	The importance of the relationship between the healthcare provider and the patient		Patient-practitioner relationship	
r56	4	KD,NF,AB	The importance of the relationship between the healthcare provider and the patient				

g53	4	KD	The patient's perspective, the clinician's perspective and the importance of managing any potential discordance or mismatch between the two				
g50	4	KD	Helping the patient share responsibility for their treatment and outcome				
g66	4		Non-specific treatment effects (e.g. Rapport, trust, compassion, empathy, therapeutic relationship)				
r60	3		The attitudes and beliefs of the patient about the healthcare profession				
r80	3		The values of both the patient and the practitioner				
r76	3.5		Acknowledgement of how the patient chooses to deal with pain				
g65 (moved from pt/indiv factors)	4		Considering the patient's perception of the clinical profession, their expertise and seniority				
r9	4	KD,AB	A clinician's own influence on the patient's beliefs and behaviour towards work			Healthcare practitioners influence	
r47	4		The effect of healthcare practitioners' own beliefs and attitudes towards the patient				
g79	5		Reducing a patients' fears		UNPLACED IN THERAPEUTIC RELATIONSHIP		
r27	3.5		That patients may find it difficult to accept that there are psychosocial influences on their pain				

g56	4	DK,NF,AB	A patient's social support network	A patient's social support network	Social support	Social relationships and support	**SOCIAL**
r11	3	KD	Awareness of the support for the patient from family and friends				
r39	4		The emotional benefits and losses to the patient (e.g. increased attention and support from family, loss of roles)				
r81	3		Social isolation				
r12	4	KD,NF	Family and friend's effect on the patient's problem	Family and friend's effect on the patient's problem	Relationship between the patient's pain problem and their social relationships		
r13	3	KD,NF	The effect of the patient's problem on their family and friends				
g49	3	KD,AB	The impact of a patient's pain problem on their social relationships, including family				
g72	3	KD,AB	The impact of a patient's social relationships on their pain experience and responses to it				
g83	3		That the presence of a family member, colleague or the clinician might change a patient's behaviour				
r65	4	KD,NF	The reaction of family and friends to the patient's problem	The reaction of family and friends to the patient's problem	Legitimacy		
g8	2	KD,AB	Whether a patient's problem is considered legitimate				
r63	2	KD	The general societal view of the problem				
g7	3	KD	How a patient's family views the 'seriousness' of the condition				
g73	3	KD,NF,AB	A patient's religious, cultural, ethnic background				

r97	3	KD	The patient's religion, culture or ethnicity	none – as not considered of high importance by either group*		Religion, culture, ethnicity	
r29	3	KD, NF (re-word), AB	The impact of the patient's physical environment (home and wider community)	The impact of the patient's physical environment (on their problem) (reword (r29/g34)		Physical environment	
g34	3.5	KD, NF (re-word)	The impact of a patient's physical environment on their ability to engage in self-management				
r49	3	KD,NF,AB	The availability of local health services	The availability of local health services	Access to/ availability of health services	Resources	
g33	3	KD	A patient's access to treatment (financial and physical)				
r71	2		Local rationing of healthcare services				
g30	4	KD, NF (re-word), AB	Community-based opportunities for self-management	The availability of community based opportunities for self-management (reword of g30/12):	Community facilities		
r50	3	KD	Awareness of local facilities to support healthy lifestyle choices				
g87	3	KD,NF,AB	A patient's related financial situation			Socio-economic context	
g55	4		A patient's socioeconomic context				
r69	2		The wider public health needs of the local population				
r28	3		(The importance of) social deprivation				
r45	3		Whether there are financial implications for the patient				

r10 (moved from pt/indiv factors)	4	AB	The roles and activities that are important to the patient			Participation and valued activity	
r24	4		The demands of the patient's roles and responsibilities				
r33	4		The patient's ability to undertake their usual activities				
r48	3		The patient's level of participation in society (e.g. social activities, work, leisure)				
r51	2		Knowledge of relevant financial benefits available to the patient		UNPLACED IN SOCIAL		
g68	3		The family history				
r3	3		Organisational understanding for and support for a biopsychosocial approach				
g31	3		An awareness of a patient's significant life events				
g63	4	KD,NF	A patient's perception of their future ability to work	A patient's perceived barriers to work A patient's perception of their future ability to work	Beliefs about their work and ability to continue/return to work	Individual's perceptions about work	**WORK**
r79	4	NF,AB	A patient's perceived barriers to work				
g48	4	KD,AB	A patient's perception of their ability to continue in work				
r53	4	AB	The patient's attitude toward work				
g64	4		A patient's perception of the physical demands of their job				
g47	4	KD,NF	A patient's perception of the link between their job and their symptoms				

r8	4	KD,AB	The patient's perceptions of the impact of their work on their problem	A patient's perception of the link between their job and their symptoms	Beliefs about the impact of work on their pain		
r54	4	KD,AB	The impact of the patient's work on their problem				
r74	4	KD	Whether the patient expects to get back to work				
g12	4	NF,KD	A patient's workplace environment	The patient's workplace environment (reword g12/r7):	Characteristics of the job	Individual's work situation	
r59	3	AB	The demands of the patient's work				
r7	4		The patient's work situation				
g93	3		A patient's job				
g46	4	KD,NF,AB	The impact of a patient's pain problem on their ability to remain in/return to work	The impact of the pain problem on ability to work (re-word of g46)	Impact of the pain problem on work		
g45	4	KD	The effects of the pain on work and work on pain				
r73	4	KD	Whether the patient is off work because of their pain problem				
g67	3	NF,AB	A patient's relationship with co-workers or supervisors	Potential reword (of g67/r58): The patient's relationship with their employer, (supervisor) and co-workers	Relationship at work		
r70	3	AB	Support from the patient's employer				
r58	3.5		The attitudes and beliefs of the patient's employer				
g75	4		Barriers to return to work		UNPLACED IN WORK		
r55	4		Early return to work				
Notes: KD=Kirsty Duncan; NF=Nadi9ne Foster; AB=Annette Bishop; r=international group; g=local group; yellow highlights indicate those items which were rated as important (4)							

Appendix 11 - Study questionnaire

The DABS Study

***D**eveloping a musculoskeletal*
***A**ttitudes and **B**eliefs **S**cale*

Keele University

We are seeking the views of clinicians who treat patients with common, non-specific musculoskeletal pain.
By **non-specific musculoskeletal pain** we mean musculoskeletal pain which is ***not*** associated with serious pathology (e.g. orthopaedic trauma or systemic rheumatological disease). We are interested in non-specific musculoskeletal pain **such as non-specific back pain, knee pain, shoulder pain etc**.

Please answer the following question by ticking the appropriate box:

Have you treated someone with **non-specific musculoskeletal pain** in the last 6 months?

Yes ☐ No ☐

If you have answered **no**, please do not fill in any further questions and return the questionnaire to us in the pre-paid envelope provided. Your response, even to this one question, is valuable to us if you **do not** treat patients with non-specific musculoskeletal pain.

If you have answered **yes** we would be very grateful if you would fill in the remainder of this questionnaire by following the instructions below. It should take no longer than 15 minutes to complete.

If you have any questions about this questionnaire or the study in general, you can contact:

Kirsty Duncan on 01782 734859

Thank you for your help with this research study

INSTRUCTIONS FOR THIS QUESTIONNAIRE

When completing the questionnaire, please try to respond as instinctively as possible - there are no 'correct' or 'incorrect' answers.

Most questions can be answered by ticking a box, e.g.

We are interested in your clinical opinion about common, non-specific musculoskeletal pain.

Section One – About you

1.1 What is your clinical profession?

Chiropractor ☐ GP ☐ Physiotherapist ☐

What year did you qualify? ……

1.2

1.3 Are you …… Male ☐ Female ☐

1.4 How much of your current role is clinical contact with patients?

76-100% ☐ 50-75% ☐ Less than 50% ☐

1.5 Do you work... *(please tick one box)*

Exclusively in the NHS ☐ Exclusively in non- NHS settings ☐ A combination of NHS and non-NHS ☐

1.6 Do you have a clinical specialty? Yes ☐ No ☐

(if yes, please specify)

……

1.7 Approximately what proportion of the people that you see clinically have non-specific musculoskeletal pain? ……%

1.8 Have you received any specific postgraduate training in the field of non-specific musculoskeletal pain?

Yes ☐ No ☐

If yes, please indicate the type of training (tick all that apply):

Informal day or weekend courses ☐

Formal training which was assessed/examined ☐

Masters or PhD (or equivalent) study ☐

Section Two – Your views about non-specific musculoskeletal pain

We are interested in your views about **non-specific musculoskeletal pain**. Please indicate the extent to which you agree or disagree with the following statements about non-specific musculoskeletal pain by **putting a tick in one box on each line**. **Please provide an answer to all the questions**. If a question does not seem directly relevant to your clinical practice, please try to provide an answer based on your belief or instinct, rather than leave it blank.

		Totally disagree	Largely disagree	Disagree to some extent	Agree to some extent	Largely agree	Totally agree
2.01	The cause of pain is unknown						
2.02	A patient's preferences about treatment must be considered						
2.03	Pain reduction is a precondition for the restoration of normal functioning						
2.04	Learning to cope with stress promotes recovery from pain						
2.05	Functional limitations associated with pain are the result of psychosocial factors						
2.06	If patients complain of pain during exercise, I worry that damage is being caused						
2.07	Effective treatment of pain must be based on the best available evidence						

2.08	The patient must always be involved in setting the goals of treatment						
2.09	A patient suffering from severe pain will benefit from physical exercise						
2.10	Increased pain indicates new tissue damage or the spread of existing damage						
2.11	Biological, psychological and social factors should all be included in the clinical assessment						
2.12	Successful return to work depends on a patient's perception of the link between their job and their symptoms						
2.13	A clinician must know what resources are available in the community to support self-management						
2.14	The way in which a patient currently copes with their pain must be assessed						
2.15	The reaction of family and friends will impact on a patient's recovery						
2.16	A patient with low motivation to engage in treatment will have a poor outcome						
2.17	A patient's beliefs about the cause of their pain must be understood						

2.18	Specific and realistic goals for treatment must be agreed with the patient						
2.19	In the long run, patients with pain have a higher risk of developing functional impairments						
2.20	A patient's perceived barriers to work must be addressed						
2.21	Family and friends have an effect on a patient's pain						

		Totally disagree	Largely disagree	Disagree to some extent	Agree to some extent	Largely agree	Totally agree
2.22	Clinicians need the appropriate skills to deliver a biopsychosocial approach						
2.23	Patients' expectations of treatment affect their outcome						
2.24	Patients' understanding about their pain should be considered						
2.25	Patients with pain should preferably practice only pain free movements						
2.26	My role as a clinician is to help patients better manage their pain and prevent recurrence						

2.27	Good listening skills are essential in the clinical management of patients						
2.28	Exercises that may strain the area affected by pain should not be avoided						
2.29	If therapy does not result in a reduction in pain, there is a high risk of severe restrictions in the long term						
2.30	I always engage my patients in their treatment plan						
2.31	Clinicians must tailor information to the patient's ability to understand						
2.32	Return to work depends on a patient's perception of their ability to work						
2.33	A patient's pain severity should be considered in the management of their pain						
2.34	Good clinician communication can increase the effectiveness of an intervention						
2.35	Mental stress can cause pain even in the absence of tissue damage						
2.36	Pain is a nociceptive stimulus, indicating tissue damage						
2.37	I always take time to provide an explanation about the patient's pain						

2.38	Anxiety and depression are key factors to consider when treating patients with pain						
2.39	A patient's response to previous treatment(s) impacts on the success of subsequent treatment						
2.40	If pain increases in severity, I immediately adjust the intensity of my treatment accordingly						
2.41	I consider a patient's social support network in my clinical management						
2.42	A patient's physical activity level should be considered in the management of their pain						
2.43	Therapy may have been successful even if pain remains						
2.44	The severity of tissue damage determines the level of pain						
2.45	The experience of pain is multi-factorial						
2.46	There is no effective treatment to eliminate pain						

		Totally disagree	Largely disagree	Disagree to some extent	Agree to some extent	Largely agree	Totally agree
2.47	Signs and symptoms that indicate serious pathology must be identified						
2.48	A patient's emotional state impacts on their pain						
2.49	Pain indicates the presence of organic injury						
2.50	Conflicting advice from healthcare consultations is harmful						
2.51	A patient's workplace environment will impact on their pain						
2.52	Other symptoms or health problems have an impact on pain						
2.53	Patients' thoughts, attitudes and feelings influence their pain						
2.54	The information needs of a patient must be met						
2.55	A patient's current level of physical function should be considered in the management of their pain						

Study number (Office use only)	

2.56	Diagnostic tests and investigations should be used for all patients with pain						
2.57	Patients' expectations of the future affect their outcome						
2.58	The clinician-patient relationship is a key component in the outcome of treatment						
2.59	It is essential to reduce a patient's fear about their pain						
2.60	There comes a point when further biomedical assessment and management is no longer appropriate						
2.61	I adapt my treatment to what I believe will be the most effective for each individual patient						
2.62	I routinely assess how confident my patients are in their ability to manage their pain						
2.63	I always assess the impact of a patient's pain on their ability to work						
2.64	Even if the pain has worsened, the intensity of the next treatment can be increased						

This is the end of the questionnaire, however please complete the consent form on the following page before returning the questionnaire in the pre-paid envelope.

Thank you.

Consent Form

We may want to contact you again about the possibility of taking a further part in this study. Giving us permission to contact you again does not mean you have to take part further.

Would you be willing to be contacted again? ***(Please tick one of the shaded boxes below)***

I am happy to be contacted again about this study…….	**Yes**		**No**	

If you answered YES to the question above please provide your name and contact details below

(these details will be kept separately from your responses to the questionnaire):

Title: Forename: Surname:

Contact address *(including postcode):*

.....

.....

E-mail address: **Daytime telephone number:**

....

Signature: **Date:**

....

Please note: if you do not want to be contacted again, we **do not** require your contact details or signature.

Please return the questionnaire in the **pre-paid** envelope provided.

If you have any queries about this study, you can contact -

Kirsty Duncan on 01782 734859

Thank you for taking the time to complete this questionnaire.

Your time and participation is greatly appreciated.

Study number (Office use only)	

Appendix 12- Other study documents

The DABS Study

***D**eveloping a musculoskeletal*
***A**ttitudes and **B**eliefs **S**cale*

[Date]

Dear [Name],

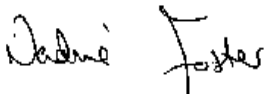
The DABS Study
Developing a musculoskeletal Attitudes and Beliefs Scale

We are writing to you in the hope that you would be willing to help with this study being supported by and conducted at the Arthritis Research UK Primary Care Centre to further develop a measure of healthcare practitioners' attitudes and beliefs about musculoskeletal (MSK) pain. You have been sent this letter because you have been identified through the British Chiropractic Association (BCA)/the Acupuncture Association of Chartered Physiotherapists (AACP)/Binley's database of GP practices (will be modified for each professional group as appropriate).

- The study has been approved by Keele University's Ethical Review Panel
- The questionnaire should take about 15 minutes to complete
- We are seeking your own professional opinion, there are no right or wrong answers
- Your answers are strictly confidential and all responses will be analysed anonymously
- Please see the enclosed information leaflet for further details
- **If you do not treat people with musculoskeletal pain**, please answer the first question on the questionnaire only and return the questionnaire in the pre-paid envelope
- **If you have any questions about the study, please contact Kirsty Duncan on 01782 734859**
- We would be grateful if you would fill in the questionnaire as soon as you can and send it back in the pre-paid envelope provided

Thank you very much for your help with this research study. Yours sincerely,





Ms Kirsty Duncan
Physiotherapist

Dr Annette Bishop
NIHR Research Fellow

Professor Nadine Foster
NIHR Professor of Musculoskeletal Health in Primary Care

The DABS Study Team

Enclosed: Participant information sheet, questionnaire, pre-paid return envelope

The DABS Study

***D**eveloping a musculoskeletal*
***A**ttitudes and **B**eliefs **S**cale*

The DABS Study - Participant Information Sheet
Developing a musculoskeletal Attitudes and Beliefs Scale

We hope that you will be willing to help with a research project we are conducting which aims to develop a measure of healthcare practitioners' (HCPs) attitudes and beliefs about musculoskeletal (MSK) pain. You have been sent this letter because you have been identified through the British Chiropractic Association (BCA)/the **Acupuncture Association of Chartered Physiotherapists (AACP)/**Binley's database of GP practices (will be modified for each professional group). This study is supported by and is being conducted by the Arthritis Research UK Primary Care Centre and has received ethical approval from Keele University's Ethical Review Panel (relevant reference to be inserted when known).

What is the purpose of the study?
MSK pain is very common and the attitudes and beliefs that clinicians hold can influence their treatment approach. Current research in this area is constrained by the lack of robust measures of HCPs' attitudes and beliefs about MSK pain. The aim of this study is to improve an existing measure of HCPs' attitudes and beliefs.

What will the study mean for me?
This study involves completing the enclosed questionnaire which includes a pool of potential items for the new measure. If you agree to take part, please complete the enclosed questionnaire and return it to us in the pre-paid envelope. The questionnaire should take approximately **15 minutes** to complete. **If you do not treat people with musculoskeletal pain**, please answer the first question only and return the questionnaire to us in the pre-paid envelope.

At the end of the questionnaire you will be asked if you would be willing to be contacted further regarding this research. If you consent to further contact you may receive a second questionnaire in a few weeks.

Do I have to take part?
Your involvement in the DABS study is purely **voluntary** and of course you do not have to take part if you do not want to.

Will my taking part in this study be kept confidential?
All the information you give us will be treated in the **strictest confidence**. All data you provide will be analysed anonymously, using study ID numbers.

What will happen to the results of the study?
The results of the study will eventually be disseminated through publication and presentation at conferences. If you would like to receive a summary of the results when they are ready to share, please provide your contact details and indicate this on the questionnaire.

Who can I contact if I wish to discuss this study?
If you have a question or concern about any aspect of this study please contact Kirsty Duncan on 01782 734859. You can also contact Dr. Annette Bishop on 01782 734859.
If you are unhappy about the research and/or wish to raise a complaint about any aspect of the study, please write to Nicola Leighton who is the University's contact for complaints regarding research at the following address:-
Nicola Leighton, Research Governance Officer, Research & Enterprise Services, Dorothy Hodgkin Building, Keele University, ST5 5BG. E-mail: n.leighton@keele.ac.uk, Tel: 01782 733306

Thank you for taking the time to read this leaflet.
If you have any questions you can contact Kirsty Duncan on 01782 734859

------ Questionnaire Reminder -----

We are writing to remind you of a questionnaire that we recently sent you, exploring healthcare practitioners' attitudes and beliefs about musculoskeletal pain. This study is being supported by and conducted within the Arthritis Research UK Primary Care Centre at Keele University. We know that you are likely to be busy, but we are still interested in your response. We would be grateful if you could complete the questionnaire and return it to us in the pre-paid envelope that we previously provided. **Your answers are strictly confidential.**

If you have returned the questionnaire within the last few days please ignore this reminder and we apologise for troubling you.

If you have any questions about the questionnaire please contact the principal investigator, Kirsty Duncan on 01782 734859

Thank you very much for your help with this research study.

Yours sincerely,

The DABS Study

***D**eveloping a musculoskeletal*
***A**ttitudes and **B**eliefs **S**cale*

[Date]

Dear [Name],

The DABS Study
Developing a musculoskeletal Attitudes and Beliefs Scale

This study concerns the development of a measure of healthcare practitioners' attitudes and beliefs about musculoskeletal pain. It is being supported and conducted by the Arthritis Research UK Primary Care Centre at Keele University. We have just been checking our records and we do not seem to have a record of you returning the questionnaire we recently sent you.

It is up to you whether you take part or not, however, your response is very important to us and your answers will be treated in the strictest confidence. All data are analysed anonymously, identified by study identification numbers only

We would be grateful if you would fill in the enclosed questionnaire within the next two weeks and send it back in the pre-paid envelope provided. If you have returned the questionnaire within the last few days please ignore this reminder and we apologise for troubling you.

If you do not treat people with musculoskeletal pain, you can tell us this by just answering the first question on the questionnaire and returning it to us in the pre-paid envelope. If you have any questions about the questionnaire please feel free to contact **Kirsty Duncan on 01782 734859**.

Thank you very much for your help with this research study.

Yours sincerely,

Ms Kirsty Duncan
Physiotherapist

Dr Annette Bishop
NIHR Research Fellow

Professor Nadine Foster
NIHR Professor of
Musculoskeletal
Health in Primary Care

The DABS Study Team

Enclosed: Participant information sheet, questionnaire, pre-paid return envelope

The DABS Study

***D**eveloping a musculoskeletal*
***A**ttitudes and **B**eliefs **S**cale*

[Date]

Dear [Name],

The DABS Study
Developing a musculoskeletal Attitudes and Beliefs Scale

Thank you for replying to our previous DABS study questionnaire and giving us permission to contact you again. We hope that you will be willing to take further part in the second stage of the DABS study. This stage of the study is designed to test certain properties of the questionnaire items investigating healthcare practitioners' attitudes and beliefs about non-specific musculoskeletal pain. Participating in this stage involves completing a similar but shorter version of the questionnaire. **This is the final stage of the study** and there will be no further involvement required. The study is being supported and conducted by the Arthritis Research UK Primary Care Centre.

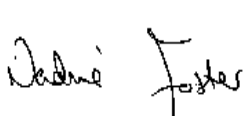
- The study has been approved by Keele University's Ethical Review Panel
- The questionnaire should take about 10 minutes to complete
- We are seeking your own professional opinion, there are no right or wrong answers
- Your answers are strictly confidential and all responses will be analysed anonymously
- Please see the enclosed information leaflet for further details
- **If you have any questions about the study, please contact Kirsty Duncan on 01782 734859**
- We would be grateful if you would fill in the questionnaire as soon as you can and send it back in the pre-paid envelope provided

Thank you very much for your help with this research study.

Yours sincerely,

Ms Kirsty Duncan
Physiotherapist

Dr Annette Bishop
NIHR Research Fellow



Professor Nadine Foster
NIHR Professor of Musculoskeletal Health in Primary Care

The DABS Study Team

Enclosed: Participant information sheet2, questionnaire2, pre-paid return envelope

The DABS Study

D*eveloping a musculoskeletal*
A*ttitudes and* ***B****eliefs* ***S****cale*

The DABS Study - Participant Information Sheet
Developing a musculoskeletal Attitudes and Beliefs Scale

Thank you for replying to our previous DABS questionnaire and giving us permission to contact you again. We hope that you will be willing to take further part in the second stage of the DABS study. This stage of the study is designed to test certain properties of the questionnaire items investigating healthcare practitioners' (HCPs) attitudes and beliefs about non-specific musculoskeletal (MSK) pain. The study is being supported and conducted by the Arthritis Research UK Primary Care Centre and has received ethical approval from the Keele University Ethical Review Panel (9th October 2013).

What is the purpose of the study?
MSK pain is very common and the attitudes and beliefs that clinicians hold can influence their treatment approach. Current research in this area is constrained by the lack of robust measures of HCPs' attitudes and beliefs about MSK pain. The aim of this study is to improve an existing measure of HCPs' attitudes and beliefs.

What will the study mean for me?
If you are willing to help us in this further part of the DABS study, you are asked to complete the brief questionnaire enclosed and return it to us in the pre-paid envelope. This questionnaire is shorter than the one you completed previously as it only contains the questions concerning your views about non-specific musculoskeletal pain. It should therefore take only **10 minutes** to complete.

This is the final stage of this study and there will therefore be no further involvement required.

Do I have to take part?
Your involvement in the DABS study is purely **voluntary** and of course you do not have to take part if you do not want to.

Will my taking part in this study be kept confidential?
All the information you give us will be treated in the **strictest confidence**. All data you provide will be analysed anonymously, using study ID numbers.

What will happen to the results of the study?
The results of the study will eventually be disseminated through publication and presentation at conferences. If you would like to receive a summary of the results when they are ready to share, please provide your contact details and indicate this on the questionnaire.

Who can I contact if I wish to discuss this study?
If you have a question or concern about any aspect of this study please contact Kirsty Duncan on 01782 734859. You can also contact Dr. Annette Bishop on 01782 734859.

If you are unhappy about the research and/or wish to raise a complaint about any aspect of the study, please write to Nicola Leighton who is the University's contact for complaints regarding research at the following address:-
Nicola Leighton, Research Governance Officer, Research & Enterprise Services, Dorothy Hodgkin Building, Keele University, ST5 5BG. E-mail: n.leighton@keele.ac.uk, Tel: 01782 733306

Thank you for taking the time to read this leaflet.

If you have any questions you can contact Kirsty Duncan on 01782 734859

------ Questionnaire Reminder -----

We are writing to remind you of a follow-up questionnaire that we recently sent you. You were selected to receive a second questionnaire having completed the initial DABS study questionnaire, and agreeing to be contacted about further participation in the study. We know that you are likely to be busy, but we are still interested in your response. We would be grateful if you could complete the questionnaire and return it to us in the pre-paid envelope that we previously provided. **Your answers are strictly confidential.**

If you have returned the questionnaire within the last few days please ignore this reminder and we apologise for troubling you.

If you have any questions about the questionnaire please contact the principal investigator, Kirsty Duncan on 01782 734859

Thank you very much for your continued support of this research study.

Yours sincerely,

The DABS Study

***D**eveloping a musculoskeletal*
***A**ttitudes and **B**eliefs **S**cale*

[Date]

Dear [Name],

The DABS Study

Developing a musculoskeletal Attitudes and Beliefs Scale

Thank you for replying to our previous DABS questionnaire and giving us permission to contact you again. This second, and final, stage of the DABS study is designed to test certain properties of the questionnaire items investigating healthcare practitioners' attitudes and beliefs about non-specific musculoskeletal pain. We have just been checking our records and we do not seem to have a record of you returning the follow-up questionnaire we recently sent you.

It is up to you whether you take part or not, however, your response is very important to us and your answers will be treated in the strictest confidence. All data are analysed anonymously, using study numbers.

We would be grateful if you would fill in the enclosed brief questionnaire within the next two weeks and send it back in the pre-paid envelope provided. If you have returned the questionnaire within the last few days please ignore this reminder and we apologise for troubling you.

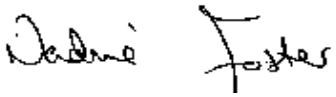
This study is being supported by the Arthritis Research UK Primary Care Centre. If you have any questions about the questionnaire please contact **Kirsty Duncan on 01782 734859.**

Thank you very much for your help with this research study.

Yours sincerely,

Ms Kirsty Duncan
Physiotherapist

Dr Annette Bishop
NIHR Research Fellow



Professor Nadine Foster
NIHR Professor of Musculoskeletal Health in Primary Care

The DABS Study Team

Enclosed: Participant information sheet2, questionnaire2, pre-paid return envelope

Appendix 13 - EFA correlation matrix

		2_01, existing PABS item 2 (Behavioural)	2_02	2_04, existing PABS item 17 (Behavioural)	2_05, existing PABS item 5 (Behavioural)	2_07	2_08	2_09, existing PABS item 4 (Behavioural)
Correlation	2_01, existing PABS item 2 (Behavioural)	1.000	-.047	.090	.146	-.111	.007	.115
	2_02	-.047	1.000	.170	.028	.219	.270	.105
	2_04, existing PABS item 17 (Behavioural)	.090	.170	1.000	.232	.147	.140	.193
	2_05, existing PABS item 5 (Behavioural)	.146	.028	.232	1.000	.108	-.015	.282
	2_07	-.111	.219	.147	.108	1.000	.238	.088
	2_08	.007	.270	.140	-.015	.238	1.000	.111
	2_09, existing PABS item 4 (Behavioural)	.115	.105	.193	.282	.088	.111	1.000
	2_11	.020	.193	.304	.118	.230	.288	.149
	2_14	.080	.222	.360	.117	.169	.295	.242
	2_15	.100	.081	.331	.146	.106	.142	.132
	2_17	.045	.211	.323	.112	.096	.307	.167
	2_18	-.084	.174	.192	-.071	.144	.433	.044
	2_20	.042	.192	.279	.047	.098	.234	.168
	2_21	.076	.066	.361	.208	.060	.066	.201
	2_22	-.019	.211	.202	.037	.296	.263	.063
	2_23	.056	.144	.302	.035	.158	.105	.081
	2_26	-.003	.162	.118	.093	.134	.108	-.005
	2_28, existing PABS item 18 (Behavioural)	.153	.007	.053	.109	.057	.102	.145
	2_30	-.178	.142	.061	-.113	.126	.287	-.096
	2_32	.054	.102	.178	.088	.075	.049	.020
	2_33	-.088	.188	.064	-.010	.166	.196	-.004
	2_37	-.268	.054	.110	-.086	.137	.234	-.112
	2_39	.109	.072	.199	.167	-.041	.014	.069
	2_41	.031	.142	.296	.121	.160	.194	.159
	2_42	-.062	.227	.232	.003	.141	.229	.107
	2_43, existing PABS item 7 (Behavioural)	.148	.164	.203	.183	.045	.191	.196
	2_46, existing PABS item 13 (Behavioural)	.239	-.030	.112	.252	-.036	-.051	.078
	2_50	.037	.118	.198	.166	.069	.157	.063
	2_51	.026	.167	.280	.107	.111	.081	.026
	2_56	-.054	.058	-.053	.012	-.072	-.131	-.134
	2_57	.010	.175	.326	.096	.092	-.002	.032
	2_58	-.043	.046	.108	.048	.157	.126	.070
	2_59	-.113	.143	.256	.110	.225	.212	.090
	2_60	.099	-.046	.116	.104	-.027	-.003	.052
	2_62	-.103	.092	.170	.060	.144	.149	.106
	2_63	-.137	.070	.172	-.008	.088	.160	.044
	2_64, existing PABS item 14 (Behavioural)	.068	-.083	.053	.208	.031	-.032	.148

a. Determinant = 1.55E-005

Correlation Matrix [a]

2_11	2_14	2_15	2_17	2_18	2_20	2_21	2_22	2_23	2_26
.020	.080	.100	.045	-.084	.042	.076	-.019	.056	-.003
.193	.222	.081	.211	.174	.192	.066	.211	.144	.162
.304	.360	.331	.323	.192	.279	.361	.202	.302	.118
.118	.117	.146	.112	-.071	.047	.208	.037	.035	.093
.230	.169	.106	.096	.144	.098	.060	.296	.158	.134
.288	.295	.142	.307	.433	.234	.066	.263	.105	.108
.149	.242	.132	.167	.044	.168	.201	.063	.081	-.005
1.000	.335	.346	.378	.391	.400	.338	.283	.227	.270
.335	1.000	.463	.456	.280	.451	.348	.284	.289	.143
.346	.463	1.000	.436	.270	.400	.602	.208	.322	.201
.378	.456	.436	1.000	.378	.509	.336	.288	.420	.259
.391	.280	.270	.378	1.000	.409	.225	.306	.249	.223
.400	.451	.400	.509	.409	1.000	.500	.230	.425	.254
.338	.348	.602	.336	.225	.500	1.000	.202	.408	.174
.283	.284	.208	.288	.306	.230	.202	1.000	.304	.235
.227	.289	.322	.420	.249	.425	.408	.304	1.000	.205
.270	.143	.201	.259	.223	.254	.174	.235	.205	1.000
.172	.094	.156	.099	.093	.120	.186	-.022	.064	.027
.211	.187	.123	.228	.326	.195	.051	.251	.153	.159
.130	.157	.309	.227	.073	.277	.248	.200	.231	.217
.089	.249	.220	.328	.155	.344	.205	.161	.281	.245
.191	.166	.169	.216	.288	.251	.122	.320	.120	.278
.139	.124	.231	.220	.117	.242	.297	.070	.296	.105
.292	.359	.399	.338	.231	.305	.365	.200	.218	.070
.264	.339	.333	.368	.211	.353	.253	.199	.250	.264
.197	.222	.242	.254	.174	.193	.228	.183	.072	.082
.043	.078	.106	.030	-.020	-.013	.155	.045	.039	-.093
.194	.214	.194	.329	.144	.328	.210	.171	.220	.130
.157	.175	.323	.262	.166	.295	.338	.205	.320	.167
-.120	-.179	-.107	-.112	-.085	-.151	-.149	.003	-.055	.136
.214	.246	.354	.336	.132	.332	.385	.088	.424	.186
.233	.206	.262	.251	.192	.242	.305	.331	.284	.280
.310	.238	.292	.353	.242	.409	.306	.265	.297	.372
.075	.069	.035	-.045	.055	.076	.039	.005	.114	-.041
.265	.271	.237	.303	.183	.216	.196	.315	.147	.202
.087	.265	.223	.305	.180	.271	.257	.286	.220	.175
.048	.122	.000	.032	-.049	-.054	.053	-.041	.004	-.137

2_28, existing PABS item 18 (Behavioural)	2_30	2_32	2_33	2_37	2_39	2_41	2_42	2_43, existing PABS item 7 (Behavioural)	2_46, existing PABS item 13 (Behavioural)
.153	-.178	.054	-.088	-.268	.109	.031	-.062	.148	.239
.007	.142	.102	.188	.054	.072	.142	.227	.164	-.030
.053	.061	.178	.064	.110	.199	.296	.232	.203	.112
.109	-.113	.088	-.010	-.086	.167	.121	.003	.183	.252
.057	.126	.075	.166	.137	-.041	.160	.141	.045	-.036
.102	.287	.049	.196	.234	.014	.194	.229	.191	-.051
.145	-.096	.020	-.004	-.112	.069	.159	.107	.196	.078
.172	.211	.130	.089	.191	.139	.292	.264	.197	.043
.094	.187	.157	.249	.166	.124	.359	.339	.222	.078
.156	.123	.309	.220	.169	.231	.399	.333	.242	.106
.099	.228	.227	.328	.216	.220	.338	.368	.254	.030
.093	.326	.073	.155	.288	.117	.231	.211	.174	-.020
.120	.195	.277	.344	.251	.242	.305	.353	.193	-.013
.186	.051	.248	.205	.122	.297	.365	.253	.228	.155
-.022	.251	.200	.161	.320	.070	.200	.199	.183	.045
.064	.153	.231	.281	.120	.296	.218	.250	.072	.039
.027	.159	.217	.245	.278	.105	.070	.264	.082	-.093
1.000	-.019	.118	.033	-.014	.119	.111	.036	.065	.029
-.019	1.000	.098	.244	.544	.018	.279	.253	.053	-.127
.118	.098	1.000	.284	.128	.345	.101	.171	.182	.094
.033	.244	.284	1.000	.253	.128	.216	.366	.050	-.059
-.014	.544	.128	.253	1.000	.035	.306	.374	.091	-.145
.119	.018	.345	.128	.035	1.000	.230	.143	.140	.128
.111	.279	.101	.216	.306	.230	1.000	.458	.299	.117
.036	.253	.171	.366	.374	.143	.458	1.000	.262	-.048
.065	.053	.182	.050	.091	.140	.299	.262	1.000	.238
.029	-.127	.094	-.059	-.145	.128	.117	-.048	.238	1.000
.091	.130	.161	.128	.138	.192	.110	.176	.244	.035
.098	.076	.252	.265	.198	.267	.238	.274	.148	.013
-.121	.082	-.013	-.016	.068	-.034	-.062	-.078	-.138	-.122
-.006	.149	.312	.220	.136	.363	.259	.282	.144	.037
.068	.253	.227	.236	.302	.199	.257	.253	.038	-.037
.085	.222	.149	.302	.311	.162	.149	.307	.047	-.050
.109	-.035	.176	-.021	-.161	.181	-.056	-.063	.050	.200
.070	.474	.191	.200	.476	.129	.385	.244	.160	-.020
.011	.338	.218	.291	.373	.120	.301	.260	-.002	-.066
.101	-.082	-.008	-.092	-.192	.042	-.002	-.149	.078	.142

2_50	2_51	2_56	2_57	2_58	2_59	2_60	2_62	2_63	2_64, existing PABS item 14 (Behavioural)
.037	.026	-.054	.010	-.043	-.113	.099	-.103	-.137	.068
.118	.167	.058	.175	.046	.143	-.046	.092	.070	-.083
.198	.280	-.053	.326	.108	.256	.116	.170	.172	.053
.166	.107	.012	.096	.048	.110	.104	.060	-.008	.208
.069	.111	-.072	.092	.157	.225	-.027	.144	.088	.031
.157	.081	-.131	-.002	.126	.212	-.003	.149	.160	-.032
.063	.026	-.134	.032	.070	.090	.052	.106	.044	.148
.194	.157	-.120	.214	.233	.310	.075	.265	.087	.048
.214	.175	-.179	.246	.206	.238	.069	.271	.265	.122
.194	.323	-.107	.354	.262	.292	.035	.237	.223	.000
.329	.262	-.112	.336	.251	.353	-.045	.303	.305	.032
.144	.166	-.085	.132	.192	.242	.055	.183	.180	-.049
.328	.295	-.151	.332	.242	.409	.076	.216	.271	-.054
.210	.338	-.149	.385	.305	.306	.039	.196	.257	.053
.171	.205	.003	.088	.331	.265	.005	.315	.286	-.041
.220	.320	-.055	.424	.284	.297	.114	.147	.220	.004
.130	.167	.136	.186	.280	.372	-.041	.202	.175	-.137
.091	.098	-.121	-.006	.068	.085	.109	.070	.011	.101
.130	.076	.082	.149	.253	.222	-.035	.474	.338	-.082
.161	.252	-.013	.312	.227	.149	.176	.191	.218	-.008
.128	.265	-.016	.220	.236	.302	-.021	.200	.291	-.092
.138	.198	.068	.136	.302	.311	-.161	.476	.373	-.192
.192	.267	-.034	.363	.199	.162	.181	.129	.120	.042
.110	.238	-.062	.259	.257	.149	-.056	.385	.301	-.002
.176	.274	-.078	.282	.253	.307	-.063	.244	.260	-.149
.244	.148	-.138	.144	.038	.047	.050	.160	-.002	.078
.035	.013	-.122	.037	-.037	-.050	.200	-.020	-.066	.142
1.000	.331	-.076	.330	.228	.290	.118	.101	.139	-.006
.331	1.000	.051	.373	.233	.207	.031	.130	.239	-.003
-.076	.051	1.000	.057	.048	-.092	-.184	.047	-.009	-.046
.330	.373	.057	1.000	.350	.345	.173	.208	.229	.065
.228	.233	.048	.350	1.000	.424	.086	.338	.319	-.104
.290	.207	-.092	.345	.424	1.000	.008	.333	.311	-.122
.118	.031	-.184	.173	.086	.008	1.000	-.071	.050	.137
.101	.130	.047	.208	.338	.333	-.071	1.000	.516	-.037
.139	.239	-.009	.229	.319	.311	.050	.516	1.000	-.036
-.006	-.003	-.046	.065	-.104	-.122	.137	-.037	-.036	1.000

Anti-image correlation

		2_01, existing PABS item 2 (Behavioural)	2_02	2_04, existing PABS item 17 (Behavioural)	2_05, existing PABS item 5 (Behavioural)	2_07	2_08	2_09, existing PABS item 4 (Behavioural)
Anti-image Correlation	2_01, existing PABS item 2 (Behavioural)	.675 [a]	.081	-.055	-.035	.104	-.104	-.016
	2_02	.081	.801 [a]	-.037	.011	-.108	-.151	-.057
	2_04, existing PABS item 17 (Behavioural)	-.055	-.037	.891 [a]	-.110	-.041	-.005	-.058
	2_05, existing PABS item 5 (Behavioural)	-.035	.011	-.110	.736 [a]	-.109	.020	-.194
	2_07	.104	-.108	-.041	-.109	.774 [a]	-.117	-.019
	2_08	-.104	-.151	-.005	.020	-.117	.844 [a]	-.048
	2_09, existing PABS item 4 (Behavioural)	-.016	-.057	-.058	-.194	-.019	-.048	.794 [a]
	2_11	.020	-.045	-.090	-.007	-.100	-.074	.011
	2_14	-.040	-.097	-.156	.009	-.011	-.093	-.088
	2_15	-.061	.091	.018	-.004	-.020	.029	.048
	2_17	-.003	-.011	-.071	-.050	.132	-.091	-.025
	2_18	.118	.011	-.027	.109	.008	-.268	.017
	2_20	-.086	-.034	.078	.066	.044	.055	-.075
	2_21	.062	.041	-.115	-.095	.098	.055	-.058
	2_22	-.055	-.106	-.015	.030	-.183	-.029	.015
	2_23	-.042	.020	-.082	.081	-.088	.054	-.006
	2_26	-.102	-.061	.046	-.105	-.023	.078	.046
	2_28, existing PABS item 18 (Behavioural)	-.136	-.014	.065	-.012	-.041	-.040	-.062
	2_30	.006	-.071	.050	.048	.018	-.107	.094
	2_32	.013	-.009	-.058	.007	-.037	.002	.035
	2_33	.045	-.054	.134	-.004	-.084	-.071	.051
	2_37	.196	.155	-.050	.006	.019	-.065	.124
	2_39	-.038	-.023	.011	-.086	.118	.003	.017
	2_41	-.030	-.001	-.094	-.045	-.094	-.003	-.020
	2_42	.036	-.067	-.016	.056	.024	-.020	-.066
	2_43, existing PABS item 7 (Behavioural)	-.071	-.079	-.006	-.042	.048	-.080	-.086
	2_46, existing PABS item 13 (Behavioural)	-.154	.001	.009	-.159	.031	.058	.057
	2_50	.010	.020	.012	-.119	.017	-.049	.038
	2_51	-.028	-.075	-.106	-.019	-.026	.025	.042
	2_56	.000	-.099	-.054	-.106	.099	.055	.045
	2_57	-.007	-.121	-.094	.066	-.043	.126	.071
	2_58	-.027	.104	.160	.022	-.026	-.006	-.071
	2_59	.099	.007	-.124	-.079	-.085	-.075	-.011
	2_60	.010	.058	-.096	-.059	.060	-.007	-.002
	2_62	.000	.018	.015	-.023	-.008	.096	-.105
	2_63	.065	.027	-.018	.041	.047	-.054	-.001
	2_64, existing PABS item 14 (Behavioural)	.045	.121	.040	-.135	-.059	.001	-.070

[a] Measures of Sampling Adequacy(MSA)

Anti-image Matrices

2_11	2_14	2_15	2_17	2_18	2_20	2_21	2_22	2_23	2_26
.020	-.040	-.061	-.003	.118	-.086	.062	-.055	-.042	-.102
-.045	-.097	.091	-.011	.011	-.034	.041	-.106	.020	-.061
-.090	-.156	.018	-.071	-.027	.078	-.115	-.015	-.082	.046
-.007	.009	-.004	-.050	.109	.066	-.095	.030	.081	-.105
-.100	-.011	-.020	.132	.008	.044	.098	-.183	-.088	-.023
-.074	-.093	.029	-.091	-.268	.055	.055	-.029	.054	.078
.011	-.088	.048	-.025	.017	-.075	-.058	.015	-.006	.046
.904 [a]	-.006	-.050	-.093	-.132	-.132	-.088	-.072	.063	-.138
-.006	.904 [a]	-.250	-.083	.020	-.192	.053	-.089	.003	.003
-.050	-.250	.881 [a]	-.157	-.074	.098	-.393	.032	.032	-.004
-.093	-.083	-.157	.913 [a]	-.113	-.157	.152	-.036	-.183	-.053
-.132	.020	-.074	-.113	.868 [a]	-.193	.014	-.099	-.025	-.095
-.132	-.192	.098	-.157	-.193	.890 [a]	-.274	.074	-.112	.011
-.088	.053	-.393	.152	.014	-.274	.850 [a]	-.036	-.145	-.011
-.072	-.089	.032	-.036	-.099	.074	-.036	.859 [a]	-.185	-.020
.063	.003	.032	-.183	-.025	-.112	-.145	-.185	.905 [a]	-.029
-.138	.003	-.004	-.053	-.095	.011	-.011	-.020	-.029	.857 [a]
-.077	.019	-.019	-.013	-.046	.039	-.106	.127	-.006	.022
-.047	-.006	.010	.008	-.145	.033	.046	.021	-.069	.055
.027	.074	-.176	.002	.113	-.131	.052	-.103	.035	-.101
.132	-.071	.034	-.116	.058	-.103	-.027	.065	-.074	-.066
.034	.022	.012	.078	-.046	-.095	.036	-.128	.066	-.117
.014	.050	.047	-.019	-.058	-.004	-.054	.040	-.112	.009
-.053	-.036	-.119	-.014	-.008	-.045	-.059	.040	.026	.125
-.053	-.080	-.052	-.047	.082	-.019	.069	.040	-.023	-.098
.040	.034	-.016	-.056	-.066	.016	-.072	-.092	.101	-.039
-.003	-.027	.015	-.014	-.031	.092	-.097	-.056	-.011	.083
-.003	-.037	.047	-.137	.080	-.130	.046	-.038	.031	.038
.025	.091	-.098	.044	-.041	-.017	-.053	-.056	-.068	.016
.047	.099	-.021	.064	.003	.014	.111	-.054	.010	-.167
-.004	-.010	-.047	-.069	.021	.026	-.101	.208	-.175	.030
-.033	-.036	.031	.001	-.010	.114	-.127	-.167	-.025	-.065
-.039	.089	-.074	-.011	.028	-.168	.009	-.030	.001	-.183
-.071	-.022	-.009	.201	-.070	-.070	.156	-.012	-.058	.008
-.128	-.066	-.001	-.061	.080	.055	.054	-.067	.051	.009
.196	-.049	.052	-.098	.007	-.012	-.125	-.088	.027	-.014
-.068	-.159	.078	-.071	.019	.069	-.037	-.008	.006	.066

2_28, existing PABS item 18 (Behavioural)	2_30	2_32	2_33	2_37	2_39	2_41	2_42	2_43, existing PABS item 7 (Behavioural)	2_46, existing PABS item 13 (Behavioural)
-.136	.006	.013	.045	.196	-.038	-.030	.036	-.071	-.154
-.014	-.071	-.009	-.054	.155	-.023	-.001	-.067	-.079	.001
.065	.050	-.058	.134	-.050	.011	-.094	-.016	-.006	.009
-.012	.048	.007	-.004	.006	-.086	-.045	.056	-.042	-.159
-.041	.018	-.037	-.084	.019	.118	-.094	.024	.048	.031
-.040	-.107	.002	-.071	-.065	.003	-.003	-.020	-.080	.058
-.062	.094	.035	.051	.124	.017	-.020	-.066	-.086	.057
-.077	-.047	.027	.132	.034	.014	-.053	-.053	.040	-.003
.019	-.006	.074	-.071	.022	.050	-.036	-.080	.034	-.027
-.019	.010	-.176	.034	.012	.047	-.119	-.052	-.016	.015
-.013	.008	.002	-.116	.078	-.019	-.014	-.047	-.056	-.014
-.046	-.145	.113	.058	-.046	-.058	-.008	.082	-.066	-.031
.039	.033	-.131	-.103	-.095	-.004	-.045	-.019	.016	.092
-.106	.046	.052	-.027	.036	-.054	-.059	.069	-.072	-.097
.127	.021	-.103	.065	-.128	.040	.040	.040	-.092	-.056
-.006	-.069	.035	-.074	.066	-.112	.026	-.023	.101	-.011
.022	.055	-.101	-.066	-.117	.009	.125	-.098	-.039	.083
.691 [a]	.041	-.095	.008	-.020	-.031	-.054	.014	.046	.067
.041	.856 [a]	-.011	-.082	-.304	.057	-.084	-.004	.042	.050
-.095	-.011	.813 [a]	-.170	-.006	-.225	.163	.011	-.110	-.059
.008	-.082	-.170	.883 [a]	.005	.023	-.033	-.153	.049	-.005
-.020	-.304	-.006	.005	.856 [a]	.017	-.060	-.164	-.030	.017
-.031	.057	-.225	.023	.017	.875 [a]	-.138	.011	.020	-.021
-.054	-.084	.163	-.033	-.060	-.138	.875 [a]	-.259	-.127	-.100
.014	-.004	.011	-.153	-.164	.011	-.259	.902 [a]	-.148	.048
.046	.042	-.110	.049	-.030	.020	-.127	-.148	.807 [a]	-.146
.067	.050	-.059	-.005	.017	-.021	-.100	.048	-.146	.722 [a]
-.054	-.080	.037	.067	-.017	-.023	.088	.037	-.174	.017
-.059	.102	-.023	-.118	-.090	-.077	-.014	-.065	-.002	.026
.036	-.078	.008	-.008	-.005	.013	-.001	.066	.084	.050
.152	-.025	-.109	.029	.015	-.129	-.041	-.068	-.023	.034
-.009	-.022	-.060	-.015	-.044	-.024	-.102	-.014	.087	.042
-.057	.024	.140	-.097	-.032	-.029	.182	-.063	.086	-.032
-.093	-.067	-.092	-.002	.136	-.083	.094	.029	-.016	-.149
-.064	-.245	-.053	.029	-.183	-.047	-.136	.110	-.120	-.012
.051	-.031	-.073	-.054	-.048	.045	-.094	-.030	.171	.045
-.083	-.041	.016	.018	.085	-.005	.015	.113	-.059	-.035

2_50	2_51	2_56	2_57	2_58	2_59	2_60	2_62	2_63	2_64, existing PABS item 14 (Behavioural)
.010	-.028	.000	-.007	-.027	.099	.010	.000	.065	.045
.020	-.075	-.099	-.121	.104	.007	.058	.018	.027	.121
.012	-.106	-.054	-.094	.160	-.124	-.096	.015	-.018	.040
-.119	-.019	-.106	.066	.022	-.079	-.059	-.023	.041	-.135
.017	-.026	.099	-.043	-.026	-.085	.060	-.008	.047	-.059
-.049	.025	.055	.126	-.006	-.075	-.007	.096	-.054	.001
.038	.042	.045	.071	-.071	-.011	-.002	-.105	-.001	-.070
-.003	.025	.047	-.004	-.033	-.039	-.071	-.128	.196	-.068
-.037	.091	.099	-.010	-.036	.089	-.022	-.066	-.049	-.159
.047	-.098	-.021	-.047	.031	-.074	-.009	-.001	.052	.078
-.137	.044	.064	-.069	.001	-.011	.201	-.061	-.098	-.071
.080	-.041	.003	.021	-.010	.028	-.070	.080	.007	.019
-.130	-.017	.014	.026	.114	-.168	-.070	.055	-.012	.069
.046	-.053	.111	-.101	-.127	.009	.156	.054	-.125	-.037
-.038	-.056	-.054	.208	-.167	-.030	-.012	-.067	-.088	-.008
.031	-.068	.010	-.175	-.025	.001	-.058	.051	.027	.006
.038	.016	-.167	.030	-.065	-.183	.008	.009	-.014	.066
-.054	-.059	.036	.152	-.009	-.057	-.093	-.064	.051	-.083
-.080	.102	-.078	-.025	-.022	.024	-.067	-.245	-.031	-.041
.037	-.023	.008	-.109	-.060	.140	-.092	-.053	-.073	.016
.067	-.118	-.008	.029	-.015	-.097	-.002	.029	-.054	.018
-.017	-.090	-.005	.015	-.044	-.032	.136	-.183	-.048	.085
-.023	-.077	.013	-.129	-.024	-.029	-.083	-.047	.045	-.005
.088	-.014	-.001	-.041	-.102	.182	.094	-.136	-.094	.015
.037	-.065	.066	-.068	-.014	-.063	.029	.110	-.030	.113
-.174	-.002	.084	-.023	.087	.086	-.016	-.120	.171	-.059
.017	.026	.050	.034	.042	-.032	-.149	-.012	.045	-.035
.850 [a]	-.205	.040	-.148	-.072	-.097	-.051	.086	-.004	.054
-.205	.898 [a]	-.076	-.107	-.018	.070	.040	.057	-.100	-.037
.040	-.076	.612 [a]	-.133	-.088	.132	.179	-.049	.021	-.022
-.148	-.107	-.133	.862 [a]	-.145	-.147	-.144	-.033	.011	-.124
-.072	-.018	-.088	-.145	.885 [a]	-.208	-.109	-.060	-.030	.092
-.097	.070	.132	-.147	-.208	.873 [a]	.061	-.128	-.058	.074
-.051	.040	.179	-.144	-.109	.061	.547 [a]	.085	-.135	-.061
.086	.057	-.049	-.033	-.060	-.128	.085	.845 [a]	-.343	.016
-.004	-.100	.021	.011	-.030	-.058	-.135	-.343	.858 [a]	-.033
.054	-.037	-.022	-.124	.092	.074	-.061	.016	-.033	.634 [a]

Appendix 14 - Item table

Item No.	Item	Missing data	Mean (SD)	Skewness	Kurtosis	Responses in both 'halves' of scale	Fate of items
01*	The cause of pain is unknown	4	3.1 (1.1)	0.1	-0.9	Yes	Step 1, 24 item analysis
02	A patient's preferences about treatment must be considered	0	5.2 (0.8)	-0.9	1.1	Yes	Step 1, 37 item analysis
04*	Learning to cope with stress promotes recovery from pain	0	5.0 (0.7)	-0.5	1.0	Yes	Step 2, 23 item analysis
05*	Functional limitations associated with pain are the result of psychosocial factors	4	3.7 (1.0)	-0.6	0.0	Yes	Step 1, 37 item analysis
07	Effective treatment of pain must be based on the best available evidence	2	4.7 (1.0)	-1.0	1.4	Yes	Step 1, 37 item analysis
08	The patient must always be involved in setting the goals of treatment	0	5.3 (0.8)	-1.0	1.1	Yes	Retained for step 3
09*	A patient suffering from severe pain will benefit from physical exercise	5	4.0 (1.1)	-0.5	0.2	Yes	Step 1, 37 item analysis
11	Biological, psychological and social factors should all be included in the clinical assessment	0	5.6 (0.6)	-1.3	1.4	Yes	Retained for step 3
14	The way in which a patient currently copes with their pain must be assessed	0	5.2 (0.7)	-0.7	1.2	Yes	Retained for step 3
15	The reaction of family and friends will impact on a patient's recovery	0	5.0 (0.8)	-0.2	-0.7	Yes	Retained for step 3
17	A patient's beliefs about the cause of their pain must be understood	0	5.2 (0.7)	-0.5	-0.3	Yes	Retained for step 3
18	Specific and realistic goals for treatment must be agreed with the patient	0	5.5 (0.6)	-0.8	0.1	Yes	Retained for step 3
20	A patient's perceived barriers to work must be addressed	0	5.3 (0.7)	-0.5	-0.5	Yes	Retained for step 3
21	Family and friends have an effect on a patient's pain	0	5.0 (0.8)	-0.4	0.2	Yes	Retained for step 3
22	Clinicians need the appropriate skills to deliver a biopsychosocial approach	0	5.1 (0.8)	-0.3	-0.6	Yes	Step 2, 23 item analysis

23	Patients' expectations of treatment affect their outcome	2	5.1 (0.7)	-0.6	1.0	Yes	Retained for step 3
26	My role as a clinician is to help patients better manage their pain and prevent recurrence	1	5.2 (0.8)	1.0	1.0	Yes	Step 1, 25 item analysis
28*	Exercises that may strain the area affected by pain should not be avoided	3	4.0 (1.2)	-0.6	-0.2	Yes	Step 1, 37 item analysis
30	Patients' expectations of treatment affect their outcome	2	5.3 (0.7)	-0.9	0.9	Yes	Step 1, 37 item analysis
32	Return to work depends on a patient's perception of their ability to work	0	5.0 (0.8)	-0.7	0.9	Yes	Step 2, 23 item analysis
33	A patient's pain severity should be considered in the management of their pain	0	5.2 (0.8)	-0.8	1.0	Yes	Step 2, 23 item analysis
37	I always take time to provide an explanation about the patient's pain	0	5.2 (0.8)	-0.8	0.4	Yes	Retained for step 3
39	A patient's response to previous treatment(s) impacts on the success of subsequent treatment	0	4.8 (0.9)	-0.9	1.5**	Yes	Step 2, 18 item analysis
41	I consider a patient's social support network in my clinical management	1	4.5 (0.9)	-0.6	1.2	Yes	Retained for step 3
42	A patient's physical activity level should be considered in the management of their pain	1	5.2 (0.7)	-0.6	1.0	Yes	Retained for step 3
43*	Therapy may have been successful even if pain remains	0	4.6 (1.0)	-0.7	0.7	Yes	Step 1, 37 item analysis
46*	There is no effective treatment to eliminate pain	0	2.5 (1.2)	0.8	0.4	Yes	Step 1, 27 item analysis
50	Conflicting advice from healthcare consultations is harmful	2	4.9 (0.9)	-0.4	0.0	Yes	Step 1, 27 item analysis
51	A patient's workplace environment will impact on their pain	0	4.7 (0.8)	0.0	-0.3		Step 2, 23 item analysis
56	Diagnostic tests and investigations should be used for all patients with pain	3	3.5 (1.7)	0.1	-1.2	Yes	Step 1, 37 item analysis
57	Patients' expectations of the future affect their outcome	1	5.0 (0.7)	-0.4	0.2	Yes	Retained for step 3
58	The clinician-patient relationship is a key component in the outcome of treatment	2	5.2 (0.7)	-0.4	-0.4	Yes	Retained for step 3

59	It is essential to reduce a patient's fear about their pain	1	5.3 (0.7)	-0.5	-0.2	Yes	Step 2, 18 item analysis
60	There comes a point when further biomedical assessment and management is no longer appropriate	4	4.4 (1.2)	-0.7	0.3	Yes	Step 1, 37 item analysis
62	I routinely assess how confident my patients are in their ability to manage their pain	0	4.5 (1.0)	-0.5	0.0	Yes	Retained for step 3
63	I always assess the impact of a patient's pain on their ability to work	0	4.8 (0.9)	-0.8	1.2	Yes	Retained for step 3
64*	Even if the pain has worsened, the intensity of the next treatment can be increased	3	3.0 (1.1)	0.0	-0.4	Yes	Step 1, 37 item analysis
Note: *=existing PABS item							

Appendix 15 - Two and three factor solution tables

3 FACTOR SOLUTION (where blank – F/L = < 0.3)

With 25 items

Item no	Item	Communality	F/L in factor 1	F/L in factor 2	F/L in factor 3
08	The patient must always be involved in setting the goals of treatment	.373			-.639
11	Biological, psychological and social factors should all be included in the clinical assessment	.346			-.574
14	The way in which a patient currently copes with their pain must be assessed	.370			-.535
17	A patient's beliefs about the cause of their pain must be understood	.489			-.558
18	Specific and realistic goals for treatment must be agreed with the patient	.418			-.656
20	A patient's perceived barriers to work must be assessed	.466			-.500
41	I consider a patient's social support network in my clinical management	**.272 cf unforced**			-.306
01	The cause of musculoskeletal pain is unknown	.152		.389	
37	I always take time to provide an explanation about the patient's pain	.524		-.675	
59	It is essential to reduce a patient's fear about their pain	.323		-.341	
62	I routinely assess how confident my patients are in their ability to manage their pain	.376		-.545	
63	I always assess the impact of a patient's pain on their ability to work	.389		-.549	
21	Family and friends have an effect on a patient's pain	.485	.593		
23	Patients' expectations of treatment affect their outcome	.373	.512		
32	Return to work depends on a patient's perception of their ability to work	.244	.488		
39	A patient's response to previous treatment(s) impacts on the success of subsequent treatment	.271	.555		
51	A patient's workplace environment will impact on their musculoskeletal pain problem	.282	.472		
57	Patients' expectations of the future affect their outcome	.461	.686		
04	**Learning to cope with stress promotes recovery from musculoskeletal pain**	**.287**	**.345**		**-.325**
15	**The reaction of a patient's family and friends will promote recovery**	**.459**	**.472**		**-.346**

58	**The clinician-patient relationship is a key component in the outcome of treatment**	**.334**	**.331**	**-.402**	
22	*Clinicians need the appropriate skills to deliver a biopsychosocial approach*	*.250*	*< 0.3*	*< 0.3*	*< 0.3*
26	*Helping a patient better manage their pain and prevent recurrence is my role as a clinician*	*.176*	*< 0.3*	*< 0.3*	*< 0.3*
33	*A patient's pain severity should be considered in the management of their musculoskeletal pain problem*	*.230*	*< 0.3*	*< 0.3*	*< 0.3*
42	*A patient's physical activity level should be considered in the management of their pain*	*.332*	*< 0.3*	*< 0.3*	*< 0.3*
Eigenvalue/Sum of squared loadings – extraction (rotated)			***6.234 (4.304)***	***1.454 (3.136)***	***.993 (4.631)***
Explained variance			***24.936%***	***5.815%***	***3.971%***

With 16 items

Item no	Item	Communality	F/L in factor 1	F/L in factor 2	F/L in factor 3
08	The patient must always be involved in setting the goals of treatment	.433			-.678
11	Biological, psychological and social factors should all be included in the clinical assessment	.340			-.438
18	Specific and realistic goals for treatment must be agreed with the patient	.504			-.677
14	The way in which a patient currently copes with their pain must be assessed	.328	.387		
15	The reaction of a patient's family and friends will promote recovery	.492	.683		
21	Family and friends have an effect on a patient's pain	.584	.805		
23	Patients' expectations of treatment affect their outcome	.328	.555		
57	Patients' expectations of the future affect their outcome	.321	.566		
37	I always take time to provide an explanation about the patient's pain	.451		.640	
41	I consider a patient's social support network in my clinical management	.320		.358	
42	A patient's physical activity level should be considered in the management of their pain	.337		.331	
62	I routinely assess how confident my patients are in their ability to manage their pain	.530		.764	
63	I always assess the impact of a patient's pain on their ability to work	.451		.674	
17	**A patient's beliefs about the cause of their pain must be understood**	**.481**	**.387**		**-.379**
20	**A patient's perceived barriers to work must be assessed**	**.490**	**.473**		**-.324**

59	*It is essential to reduce a patient's fear about their pain*	*.273*	*< 0.3*	*< 0.3*	*< 0.3*
Eigenvalue/Sum of squared loadings – extraction (rotated)			***4.788 (3.797)***	***1.043 (3.108)***	***.831 (2.831)***
Explained variance			***29.927%***	***6.516%***	***5.195%***

2 FACTOR SOLUTION (where blank – F/L = < 0.3)

With 25 items

Item no	Item	Communality	F/L in factor 1	F/L in factor 2
08	The patient must always be involved in setting the goals of treatment	.212	.484	
11	Biological, psychological and social factors should all be included in the clinical assessment	.249	.388	
18	Specific and realistic goals for treatment must be agreed with the patient	.282 signif ↓	.505	
22	Clinicians need the appropriate skills to deliver a biopsychosocial approach	.253	.484	
26	Helping a patient better manage their pain and prevent recurrence is my role as a clinician	.166	.368	
33	A patient's pain severity should be considered in the management of their musculoskeletal pain problem	.213	.378	
37	I always take time to provide an explanation about the patient's pain	.473	.739	
41	I consider a patient's social support network in my clinical management	.273	.395	
42	A patient's physical activity level should be considered in the management of their pain	.336	.502	
58	The clinician-patient relationship is a key component in the outcome of treatment	.261	.406	
59	It is essential to reduce a patient's fear about their pain	.315	.486	
62	I routinely assess how confident my patients are in their ability to manage their pain	.319	.580	
63	I always assess the impact of a patient's pain on their ability to work	.304	.546	
01	The cause of musculoskeletal pain is unknown	.116		.316
04	Learning to cope with stress promotes recovery from musculoskeletal pain	.267		.452
15	The reaction of a patient's family and friends will promote recovery	.453		.561
21	Family and friends have an effect on a patient's pain	.491		.648
23	Patients' expectations of treatment affect their outcome	.374		.535
32	Return to work depends on a patient's perception of their ability to work	.192		.399
39	A patient's response to previous treatment(s) impacts on the success of subsequent treatment	.247		.521
51	A patient's workplace environment will impact on their musculoskeletal pain problem	.258		.421

57	Patients' expectations of the future affect their outcome	.378		.583
14	**The way in which a patient currently copes with their pain must be assessed**	**.299**	**.356**	**.304**
17	**A patient's beliefs about the cause of their pain must be understood**	**.437**	**.451**	**.344**
20	**A patient's perceived barriers to work must be assessed**	**.433**	**.409**	**.386**
Eigenvalue/Sum of squared loadings – extraction (rotated)			***6.194 (5.085)***	***1.407 (4.254)***
Explained variance			***24.776%***	***5.627%***

With 16 items

Item no	Item	Communality	F/L in factor 1	F/L in factor 2
08	The patient must always be involved in setting the goals of treatment	.194		.425
18	Specific and realistic goals for treatment must be agreed with the patient	.286		.386
37	I always take time to provide an explanation about the patient's pain	.480		.768
41	I consider a patient's social support network in my clinical management	.300		.351
42	A patient's physical activity level should be considered in the management of their pain	.345		.420
59	It is essential to reduce a patient's fear about their pain	.276		.317
62	I routinely assess how confident my patients are in their ability to manage their pain	.361		.614
63	I always assess the impact of a patient's pain on their ability to work	.324		.551
11	Biological, psychological and social factors should all be included in the clinical assessment	.269	.354	
14	The way in which a patient currently copes with their pain must be assessed	.328	.448	
15	The reaction of a patient's family and friends will promote recovery	.488	.714	
17	A patient's beliefs about the cause of their pain must be understood	.457	.474	
20	A patient's perceived barriers to work must be assessed	.476	.549	
21	Family and friends have an effect on a patient's pain	.539	.798	
23	Patients' expectations of treatment affect their outcome	.329	.592	
57	Patients' expectations of the future affect their outcome	.270	.537	
Eigenvalue/Sum of squared loadings – extraction (rotated)			***4.740 (4.072)***	***.984 (3.571)***
Explained variance			***29.624%***	***6.151%***

Appendix 16 - CFA Modification indices a) Biopsychosocial b) Biomedical

a). Modification indices in the CFA of the existing biopsychosocial scale items

Error pairing	MI
e8 ↔ e9	7.862
e4 ↔ e9	5.378
e4 ↔ e5	6.324
e3 ↔ e5	5.460
e1 ↔ e7	4.067
e1 ↔ e5	4.547
e1 ↔ e4	10.155
e1 ↔ e2	4.751

b). Modification indices in the CFA of the existing biomedical scale items

Error pairing	MI
e9 ↔ e10	12.170
e8 ↔ e10	6.723
e7 ↔ e10	24.864
e7 ↔ e9	4.903
e5 ↔ e9	5.770
e5 ↔ e8	9.268
e5 ↔ e6	4.037
e4 ↔ e6	15.270
e3 ↔ e10	5.868
e2 ↔ e10	7.995
e2 ↔ e9	5.658
e2 ↔ e7	7.927
e2 ↔ e5	12.249
e2 ↔ e3	20.095
e1 ↔ e8	4.631
e1 ↔ e6	6.448